VOL. XXIV. No. 3. MARCH 1939

MECCANO MAGAZINE

ON AIRCRAFT WORK

6D.

THE 1938-9 HORNBY BOOK of TRAINS

The 1938-9 issue of the "Hornby Book of Trains" should be in the hands of every railway enthusiast.

The beautiful coloured cover shows a striking picture of the famous "*Cornish Riviera Limited*," specially painted by the well-known artist Bryan de Grineau. The contents of the Book are more varied than ever. They include articles, fully illustrated by splendid photographs, dealing with little-known features of railway goods traffic, automatic train control on the G.W.R., the famous L.N.E.R. and L.M.S. expresses on the London-Scotland routes, the mysteries of the Travelling Post Office, and the Continental Boat Trains of the Southern Railway.

In addition the Book forms a complete catalogue of Hornby Trains for electric and clockwork railways. All the Hornby Locomotives, Rolling Stock and Accessories are beautifully illustrated in full colour.

How to obtain the Book

The Hornby Book of Trains may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13, price 4½d. post free. In the latter case a remittance in stamps should be sent and the name and address of the sender should be clearly written.

Readers living in Australia, New Zealand or South Africa who require copies should send their postal orders for 8d. (which includes postage) to the addresses given below. The Meccano Branch at Toronto will deal with Canadian orders and the price is 15 cents postpaid.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Liverpool 13, sending 6d. in stamps with their order.

AUSTRALIAN AGENTS: E. G. Page & Co., 52, Clarence St., Sydney (P.O. Box 1832k).

NEW ZEALAND AGENTS: Models Limited, Paykel's Buildings, Anzac Avenue, Auckland C.1 (P.O. Box 129).

SOUTH AFRICAN AGENT: Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).

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HAMLEYS *present the* "SPEED DEMON"

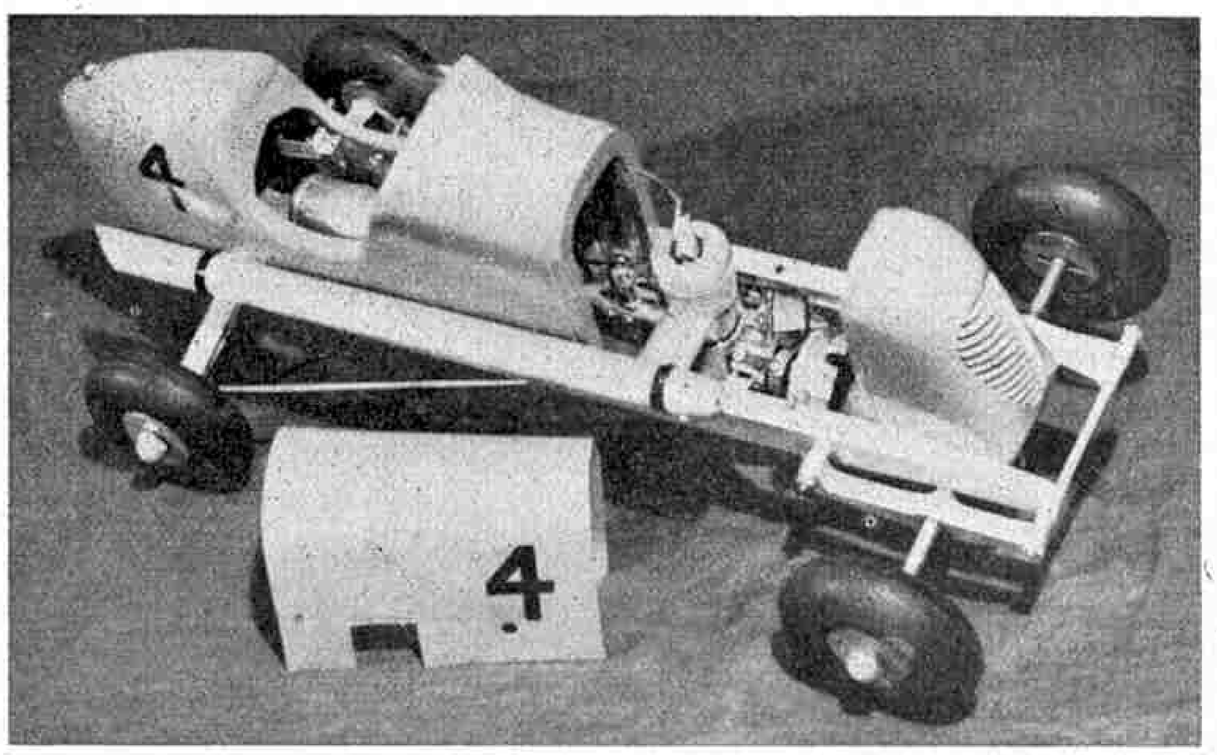
A REAL PETROL-DRIVEN RACING CAR CAPABLE OF 50 M.P.H.

Here's a genuine model of a racing car exactly as you see them at Brooklands or the Crystal Palace! Its perfect detail and remarkable performance make it a joy to run and it gives the thrill of a full size car.

You can tether it to a pole in a confined space or you can steer it in as large a circle as you like. It's grand to watch it knocking off lap after lap at high speed.

The model is built from a construction kit which is so designed that even the youngest of builders will have no difficulty in carrying out the construction. No special tools are required—only the normal screwdriver and pliers.

It is powered with the 'Speedway' Petrol Motor developing $\frac{1}{5}$ H.P. and 8,000 r.p.m., the drive being through a real operating clutch. Pneumatic tyred wheels, front and rear axles, friction front wheel drive, chassis members and numerous other parts are all ready machined and assembled.



WHEEL TRACK 8½ in. WHEEL BASE 14½ in. (Made in U.S.A.) TOTAL WEIGHT 5 lbs.

Complete Construction Kit	£4 10 0
'Speedway' Petrol Motor	£4 2 6
(Assembled and wired up with coil and condenser ready to run)	£11 0 0

Hamleys Estd 1760 HAMLEY BROTHERS LTD

Telephone: Regent 3161

By Appointment to H. M. Queen Mary

200-202, REGENT STREET, LONDON W.1 (*Our Only Address*)

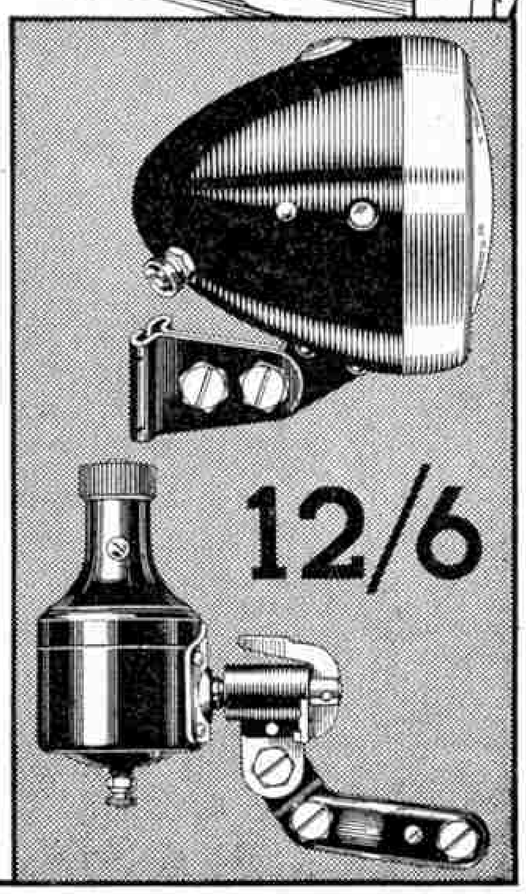
CAR-TYPE LIGHTING for your cycle for only 12/6

That is what Miller offers you in the new Ultra-light dynamo set—a set which combines brilliance and efficiency with light weight.

Modern lightweight, streamlined, car-type headlamp, with press button control. Standard 6-volt 3-watt car-type bulb (gas-filled). The 15½ oz. dynamo weighs only 4·75 oz. per watt, can be adapted for either front or rear wheel drive and can be used in conjunction with a tail lamp.

Set complete	..	12/6
All chrome	..	15/6
Tail lamp	..	1/6 extra

See this Miller Set at your local cycle shop TODAY.



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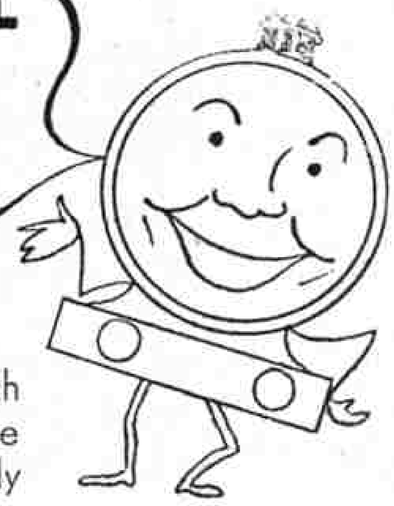
Catalogue free from: H. MILLER & Co. Ltd., Aston Brook Street, Birmingham, 6 London: Devonshire Hse., Charlotte St., W.1

A SQUARE DEAL FOR *MODEL* RAILWAYS!



YOU'RE certain of a square deal with Milbro Locos. They're true-to-scale replicas of actual locomotives—mechanically perfect, thrillingly *real!* Milbro Locos run with the same precision, are built to the same high standard as the fine expresses they represent.

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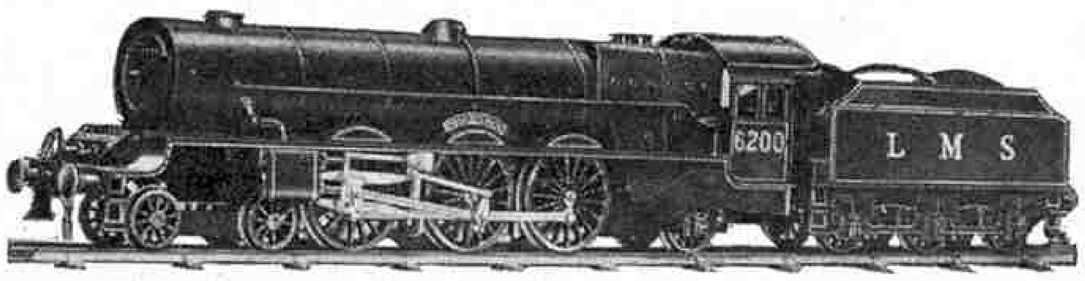

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PERFECT SCALE MODELS

DINKY TOYS

OVER 300 VARIETIES

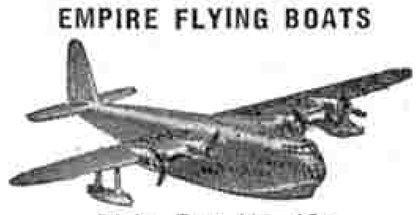
Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes. New items are continually being introduced to the range, amongst which are scale models of a Mobile Anti-Aircraft Unit and an 18-Pounder Quick-Firing Unit.

FAIREY "BATTLE" BOMBER

Dinky Toys No. 60n

Model of the Fairey "Battle" day bomber, a type much used by the R.A.F. It carries a pilot and gunner. Price **4½d.** each

EMPIRE FLYING BOATS



Dinky Toys No. 60r

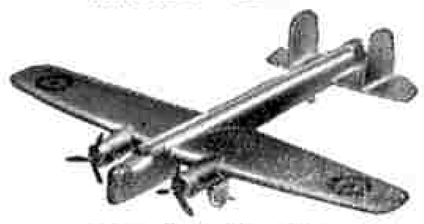
Scale models of the famous Imperial Airways Flying Boats. Twelve models available named: "*Caledonia*," "*Canopus*," "*Corsair*," "*Challenger*," "*Centurion*," "*Cambria*," "*Capella*," "*Ceres*," "*Clio*," "*Calypso*," "*Corinna*" and "*Cheviot*." Price **1/-** each

ATLANTIC FLYING BOAT

Dinky Toys No. 60x

Similar in type to the Empire Flying Boat. Assorted colours. Price **1/-** each

ARMSTRONG WHITWORTH "WHITLEY" BOMBER



Dinky Toys No. 60v

Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F. Price **9d.** each

ARMSTRONG WHITWORTH "WHITLEY" BOMBER

(With Shadow Shading) Dinky Toys No. 62t

Similar to Dinky Toys No. 60v but with Air Ministry Shadow Shading. Price **11d.** each

FLYING BOAT "CLIPPER III"

Dinky Toys No. 60w

Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937

Price **1/-** each

REFUELLING TENDER

Dinky Toys No. 60y

Realistic model of Thompson Bros. Tender used for refuelling aeroplanes at aerodromes. Price **8d.** each

NEW THIS MONTH!!

MOBILE ANTI-AIRCRAFT UNIT

Dinky Toys No. 161

Comprises scale models of a quick-firing anti-aircraft Gun mounted on a mobile platform and a Searchlight mounted on a lorry. Both Gun and Searchlight have elevating and swivelling movements. Price **3/-** per set

18-POUNDER QUICK-FIRING FIELD GUN UNIT

Dinky Toys No. 162

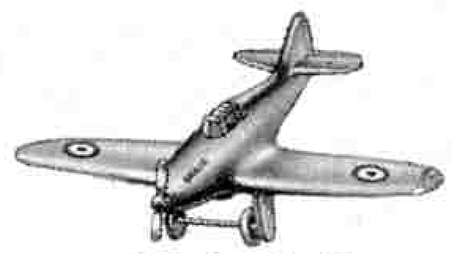
Comprises scale model 18-pounder quick-firing Field Gun, Trailer and "Light Dragon" Motor Tractor. Price **2/-** per set

HAWKER "HURRICANE" SINGLE-SEATER FIGHTER (Shadow Shaded)

Dinky Toys No. 62h

Scale model of the Hawker "Hurricane" single-seater Fighter extensively used by the R.A.F. Price **6d.** each

HAWKER "HURRICANE" SINGLE-SEATER FIGHTER (Aluminium Finish)



Dinky Toys No. 62s

Similar to Dinky Toys No. 62h, but with Aluminium finish. Price **6d.** each

AIRSPEED "ENVOY" MONOPLANE

Dinky Toys No. 62m

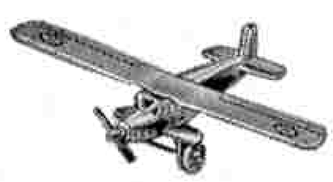
Scale model of the Airspeed "Envoy" twin-engined commercial monoplane. Assorted colours. Price **6d.** each

THE KING'S AEROPLANE

Dinky Toys No. 62k

Scale model of the Airspeed "Envoy" supplied to the Air Council for the King's Flight. Price **8d.** each

AEROPLANES



Dinky Toys No. 61z

This set consists of six models of French Aeroplanes—Dewoitine 338, Dewoitine 500d, Potez 58, Potez 56, Hanriot H180M and Farman F360. (Made in the Meccano Factory in Paris.) Price **3/-**

JUNKERS Ju 90 AIR LINER

Dinky Toys No. 62n

Scale model of the latest type of German air liner, having a top speed of 256 m.p.h. Price **11d.** each

GIANT HIGH-SPEED MONOPLANE

Dinky Toys No. 62y

Similar in type to Junkers "Ju 90" Air Liner. Assorted colours. Price **11d.** each

ARMSTRONG WHITWORTH "ENSIGN" AIR LINER

Dinky Toys No. 62p

Scale model of the largest British air liner. Six models available, named: "*Ensign*," "*Elsinore*," "*Explorer*," "*Echo*," "*Ettrick*" and "*Elysian*." Price **1/-** each

BRITISH 40-SEATER AIR LINER

Dinky Toys No. 62x

Similar in type to the Armstrong Whitworth "Ensign" Air Liner. Assorted colours. Price **1/-** each

Dinky Toys No. 62w

IMPERIAL AIRWAYS "FROBISHER" CLASS LINER

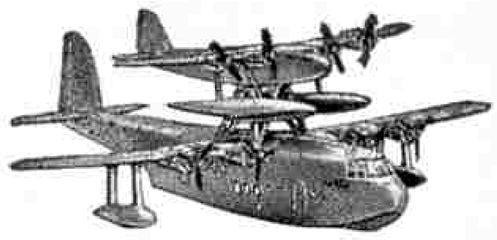
Scale models of the Imperial Airways "Frobisher" class liners. Three models available, named: "*Frobisher*," "*Falcon*" and "*Fortuna*." Price **10d.** each

DE HAVILLAND "ALBATROSS" MAIL LINER

Dinky Toys No. 62r

Scale model of one of the "Albatross" mail liners built for the Air Ministry for experimental flights. Price **10d.** each

MAYO COMPOSITE AIRCRAFT



Dinky Toys No. 63

Scale model of the Mayo Composite Aircraft. Price **2/-** each

The components of the above can be purchased separately.

No. 63a Flying Boat "*Maia*" ... **1/3** each

No. 63b Seaplane "*Mercury*" ... **9d.** each

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

A FASCINATING COLLECTING HOBBY

DINKY TOYS

FINISHED IN RICH COLOURS

"THUNDERBOLT" SPEED CAR

Dinky Toys No. 23m
A fine scale model of the car in which Capt. G. E. T. Eyston set up a world land speed record of 357.50 m.p.h. at Bonneville, Utah, U.S.A. Price **10d.** each

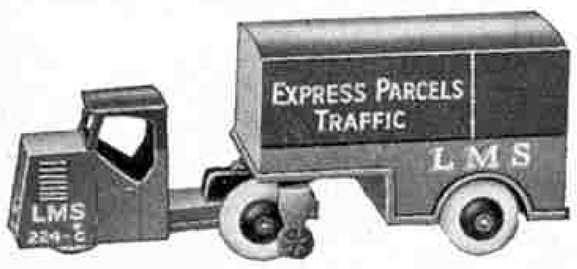
STREAMLINED RACING CAR

Dinky Toys No. 23s
Similar in type to the *"Thunderbolt"* Speed Car. Assorted colours. Price **9d.** each

DIESEL RAIL CAR

Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each
(Made in the Meccano Factory in Paris.)

RAILWAY MECHANICAL HORSE AND TRAILER VAN



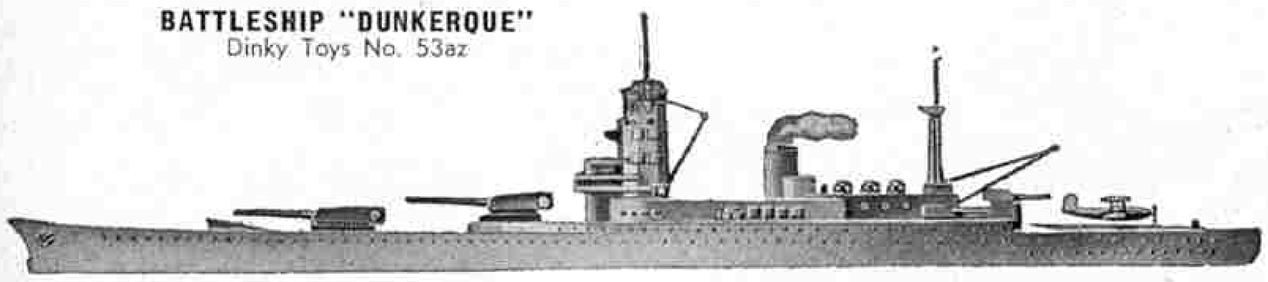
Dinky Toys No. 33R
No. 33Ra Railway Mechanical Horse ... ... each **8d.**
No. 33Rd Trailer Van ... ... „ **10d.**
Fitted with detachable rubber tyres.
Price complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

SMALL CARS

Dinky Toys No. 35 Fitted with solid rubber wheels.
No. 35a Saloon Car each **3d.** No. 35b Racer each **3d.**
No. 35c M.G. Sports Car ... ... „ **3d.**
Price of complete set **9d.**

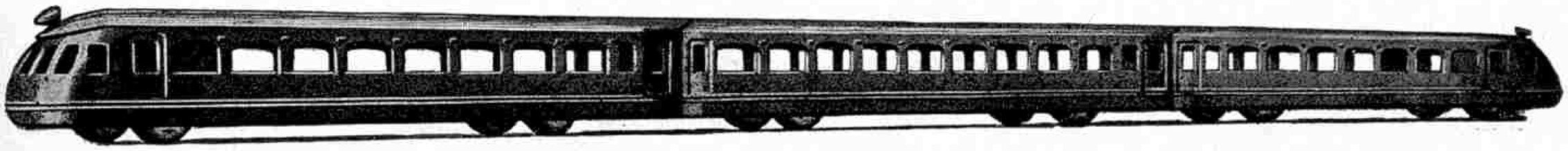
BATTLESHIP "DUNKERQUE"

Dinky Toys No. 53az



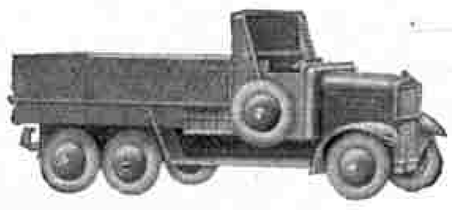
Scale model of the French 26,500 ton Battleship *"Dunkerque,"* which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris.)

STREAMLINED DIESEL ARTICULATED TRAIN



Dinky Toys No. 16z Price **1/6** each

SIX-WHEELED WAGON

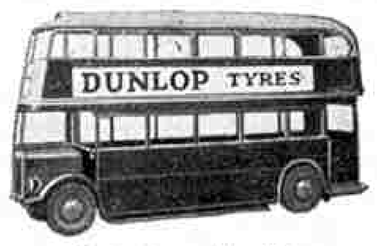


Dinky Toys No. 25s
An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER

Dinky Toys No. 36g
Fitted with detachable rubber tyres.
Price **11d.** each

DOUBLE DECKER BUS



Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
Price **1/-** each

POLICE MOTOR CYCLIST

Dinky Toys No. 37b

Price **6d.** each

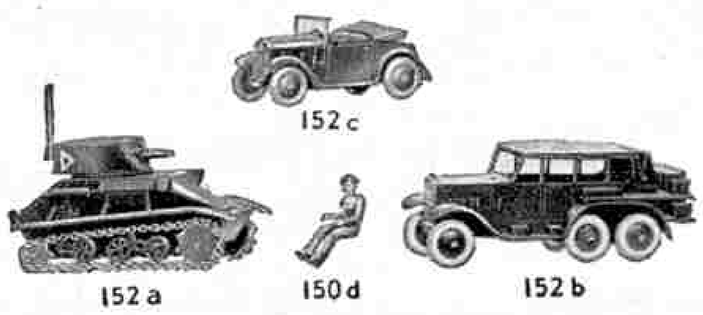
CIVILIAN MOTOR CYCLIST

Dinky Toys No. 37a

Assorted colours. Price **6d.** each

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c
Similar to Dinky Toys No. 37b. Finished in correct colours. Fitted with solid rubber wheels. Price **6d.** each

ROYAL TANK CORPS LIGHT TANK SET



152c

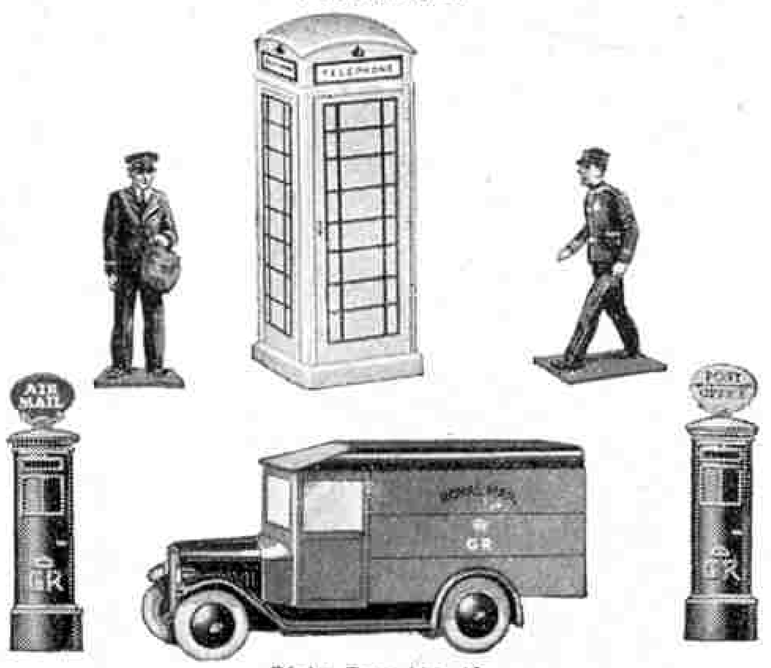
152a 150d 152b

Dinky Toys No. 152
No. 152a Light Tank (4½ tons, 25 h.p.) ... ... each **1'2**
No. 152b Reconnaissance Car ... „ **1'-**
No. 152c Austin Seven Car ... „ **4d.**
No. 150d Driver ... ... „ **3d.**
Price of complete set **2'9**

AUSTIN SEVEN CAR

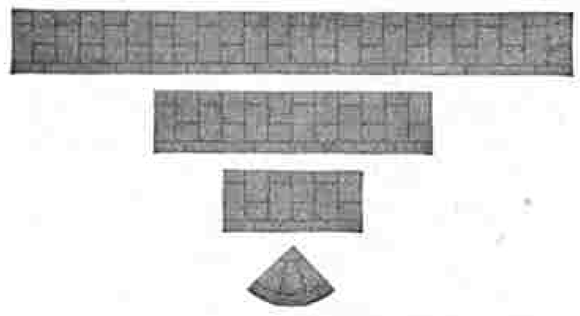
Dinky Toys No. 35d
This model is the same as No. 152c, illustrated above, except that it is finished in a range of different colours. Price **4d.** each

POSTAL SET



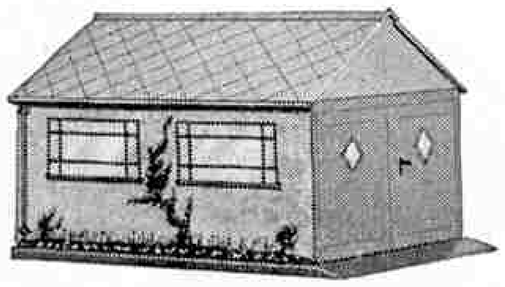
Dinky Toys No. 12
No. 12a Pillar Box, G.P.O. ... ... each **3d.**
No. 12b „ „ Air Mail ... ... „ **3d.**
No. 12c Telephone Call Box ... ... „ **4d.**
No. 12d Telegraph Messenger ... ... „ **3d.**
No. 12e Postman ... ... „ **3d.**
No. 34b Royal Mail Van ... ... „ **10d.**
Price of complete set **2/3**

PAVEMENT SET



Dinky Toys No. 46
The contents of this set are four 3 in., six 6 in. and four 12 in. strips of pavement and four quarter discs for corners. Price of complete set **6d.**

GARAGE



Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars. Price **1/3** each

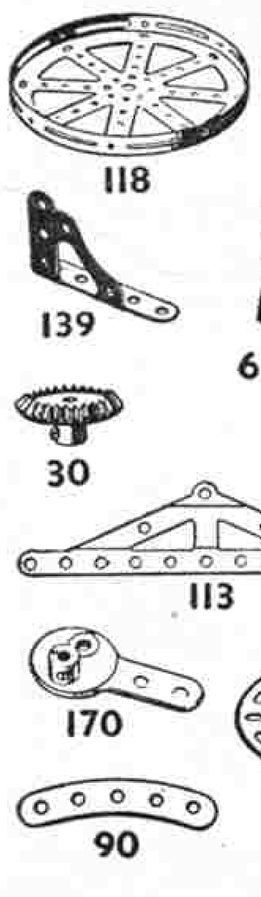
THREE-WHEELED DELIVERY VAN

Dinky Toys No. 14z
Fitted with opening lid.
Price **10d.** each
(Made in the Meccano Factory in Paris.)

(Made in the Meccano Factory in Paris.)

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

MECCANO ACCESSORY PARTS



Meccano parts, a small selection of which is illustrated here, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. Ask your dealer for the latest complete illustrated price list.

No.			s.	d.
17.	Axle Rods, 2″	doz.	0	3
19a.	Wheels, 3″ diam., with set screws	each	0	6
20.	Flanged Wheels, 1⅛″ diam.	,,	0	3½
26b.	Pinion Wheels, ½″ dia., ⅜″ face	,,	0	6
29.	Contrate Wheels, ¾″ diam.	,,	0	4
30.	Bevel Gears, ⅞″, 26 teeth	,,	0	6
45.	Double Bent Strips ...	,,	0	1
55.	Perforated Strips, slotted, 5½″ long	doz.	1	3
62.	Double Arm Cranks	each	0	2½
66.	Weights, 50 grammes	,,	0	9
67.	,, 25 ,,	,,	0	6
76.	Perforated Triangular Plates, 2½″	,,	0	2
90.	2½″ Curved Strips, 2⅜″ radius	,,	0	1
96.	Sprocket Wheels, 18 teeth, 1″ diam. ...	,,	0	3
106a.	Sand Rollers	,,	1	3
108.	Architraves	doz.	1	9
109.	Face Plates, 2½″ diam.	each	0	3½
113.	Girder Frames	,,	0	3
114.	Hinges	,,	0	3

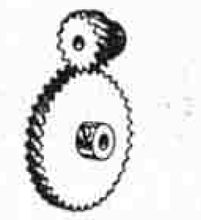
No.			s.	d.
116.	Fork Pieces, large ...	each	0	2½
118.	Hub Discs, 5½″ diam.	,,	1	0
121.	Train Couplings ...	,,	0	1
124.	Reversed Angle Brackets, 1″	½ doz.	0	4½
126a.	Flat Trunnions	each	0	1
131.	Dredger Buckets ...	,,	0	2½
132.	Flywheels, 2¾″ diam.	,,	2	0
139.	Flanged Brackets (R.H.)	,,	0	2
147.	Pawls, with Pivot Bolts and Nuts	,,	0	3
148.	Ratchet Wheels ...	,,	0	4
150.	Crane Grabs	,,	0	6
151.	Pulley Blocks, single sheave	,,	0	7
158a.	Signal Arms, Home	,,	0	5
168.	Ball Bearings, 4″ diam.	,,	3	0
170.	Eccentrics, ¼″ throw	,,	0	9
180.	Toothed Gear Ring, 3½″ diam. {133 external teeth / 95 internal ,,}	,,	1	0
*211a.	Helical Gears, ½″	,,	0	10
*211b.	,, ,, 1½″	,,	2	3

Can only be used together

MECCANO LTD., Binns Road
LIVERPOOL 13

MORE PARTS . . .

A Meccano enthusiast putting the finishing touches to a splendid model Pontoon Crane. The model is driven by a Clockwork Motor and will lift actual loads.

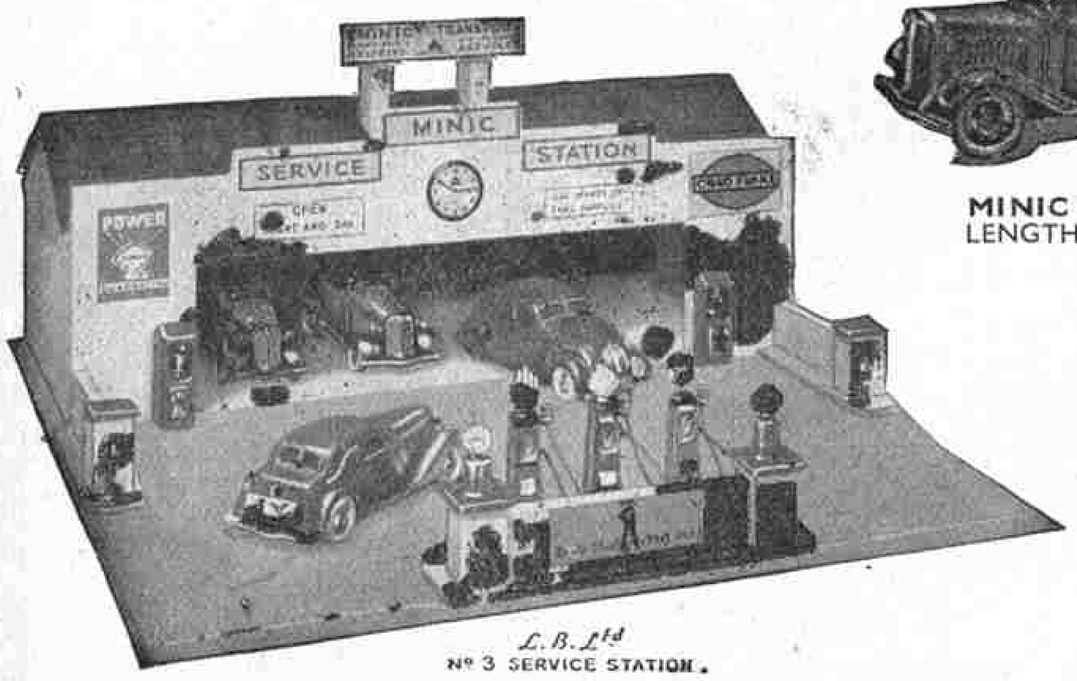


BETTER MODELS

MINIC MODELS

ROAD TRANSPORT TRUE TO SCALE

Here's a fascinating new hobby, collecting real true-to-scale models of every form of road transport, with perfect replicas of garages, petrol stations, etc. If you are already a model railway enthusiast become a transport enthusiast as well—or start with a hobby by becoming a model transport collector. Almost every type of road transport is represented. Each model is strongly constructed and fitted with long running mechanism and some are even fitted with electric lights.



MINIC Service Station No. 3.
Realistic design, imitation red tiled roof with sign, three large petrol pumps, one large oil cabinet, two electric lights and battery, dummy clock face and other signs. LENGTH 16 ins. Price **8/11**
CARS NOT INCLUDED.

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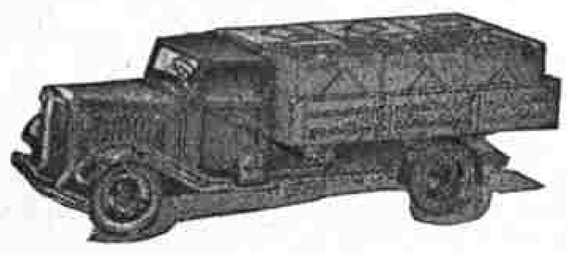
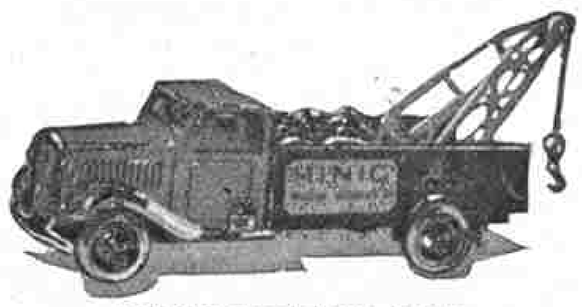


MINIC Lorry with Cases.
LENGTH 5½ ins. Price **1/6**

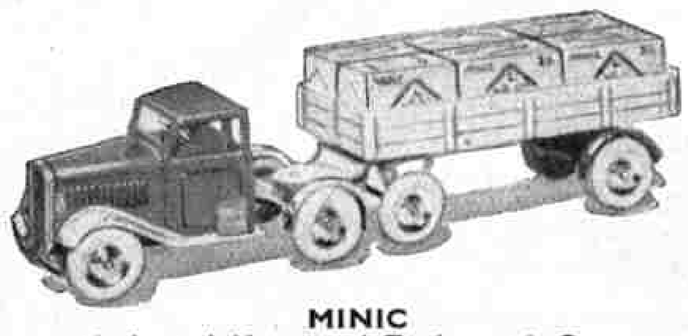
MINIC Taxi.
LENGTH 4½ ins. Price **2/–**

MINIC Traffic Control Car.
LENGTH 5 ins. Price **1/6**

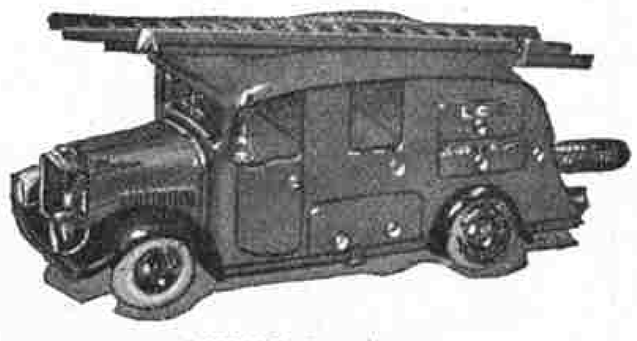
MINIC Daimler Sunshine Saloon
with Electric Headlamps and Battery.
LENGTH 5½ ins. Price **3/6**
Without Electric Lights - **2/6**



MINIC Breakdown Lorry
with Mechanical Crane.
LENGTH 5½ ins. Price **3/6**



MINIC
Mechanical Horse and Trailer with Cases.
LENGTH 7⅜ ins. Price **2/6**



MINIC Fire Engine
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British Patent 479,430. Patents pending in other Countries.

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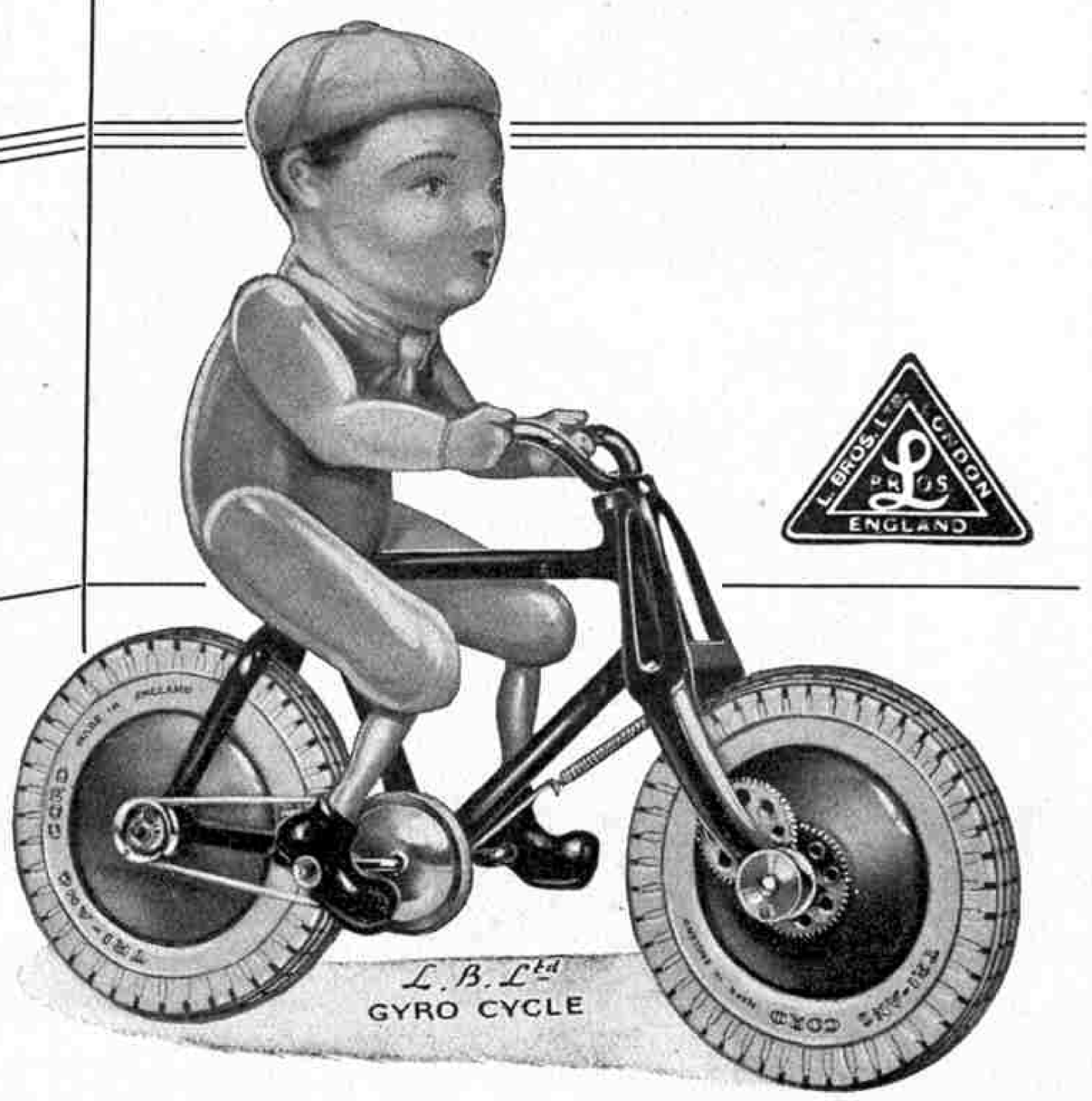

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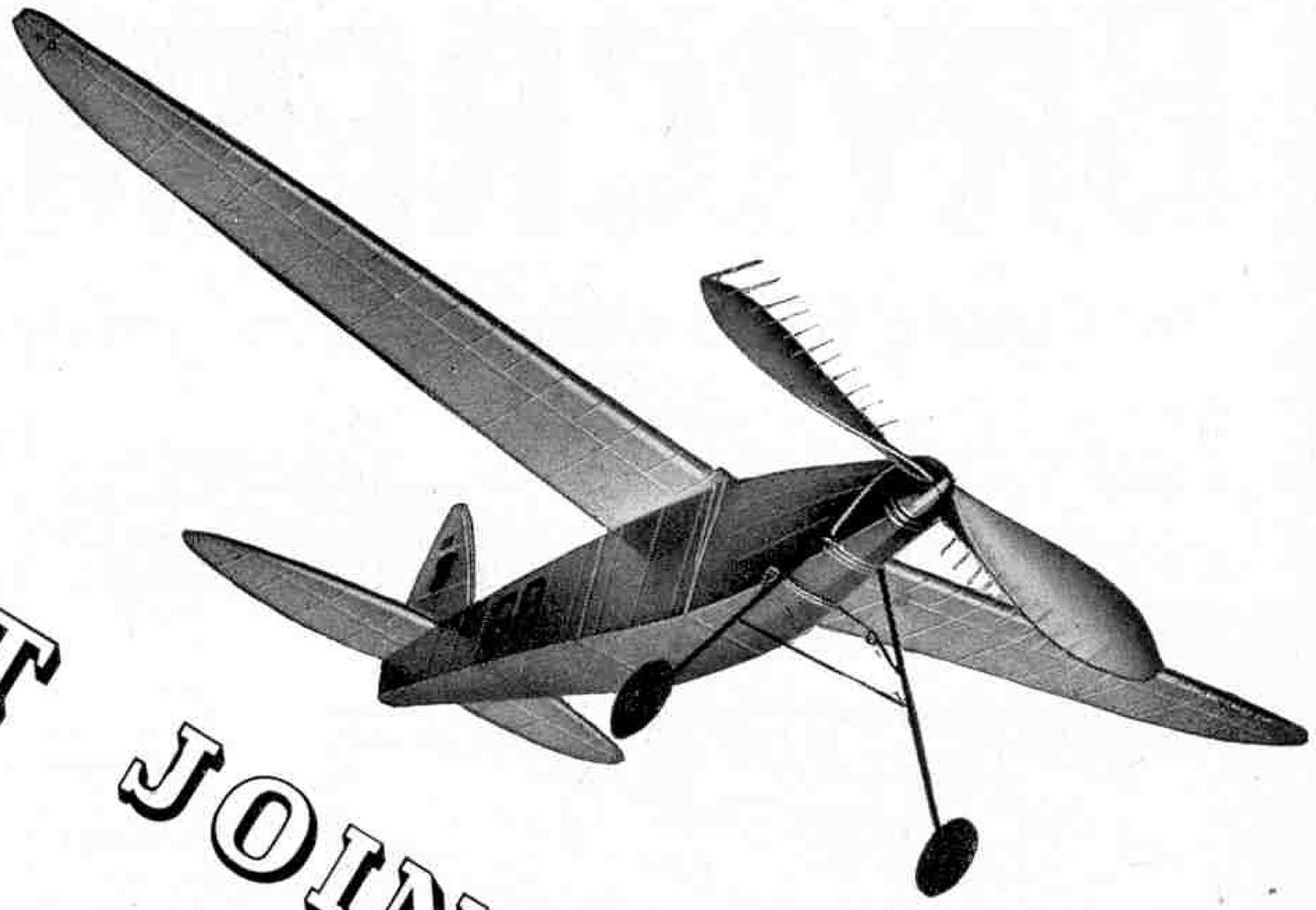

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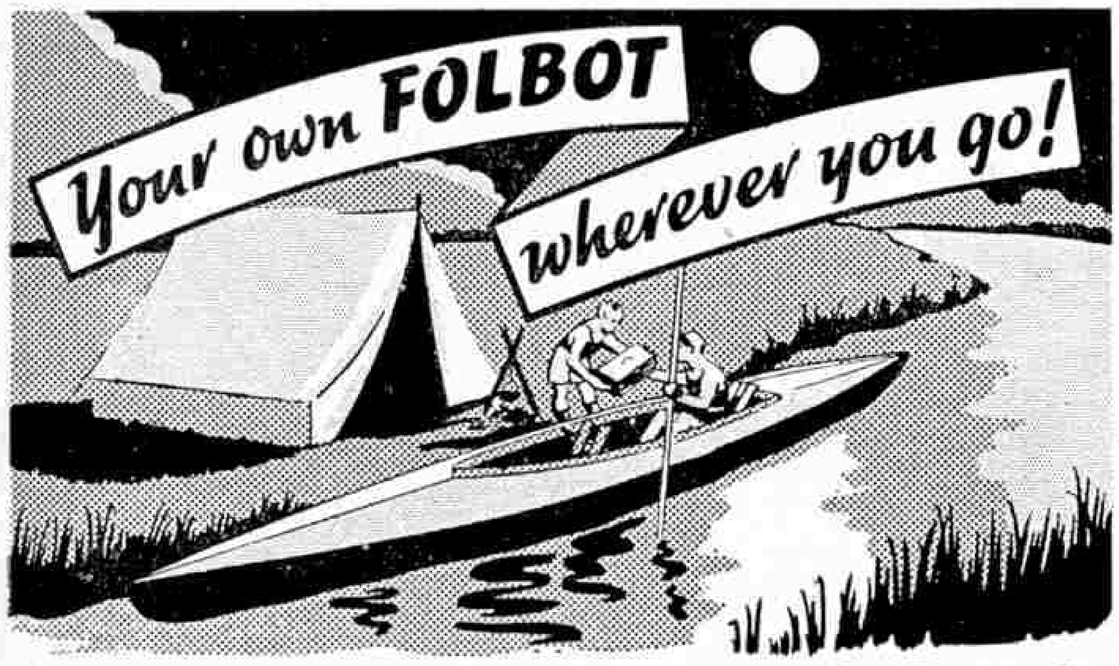

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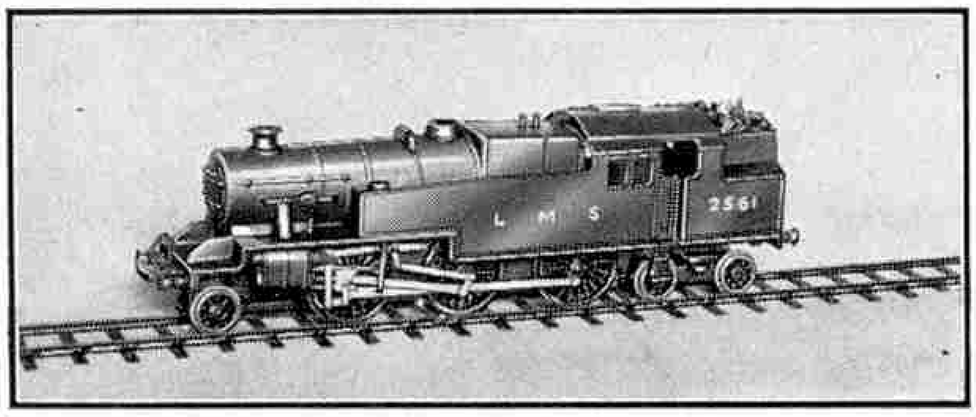

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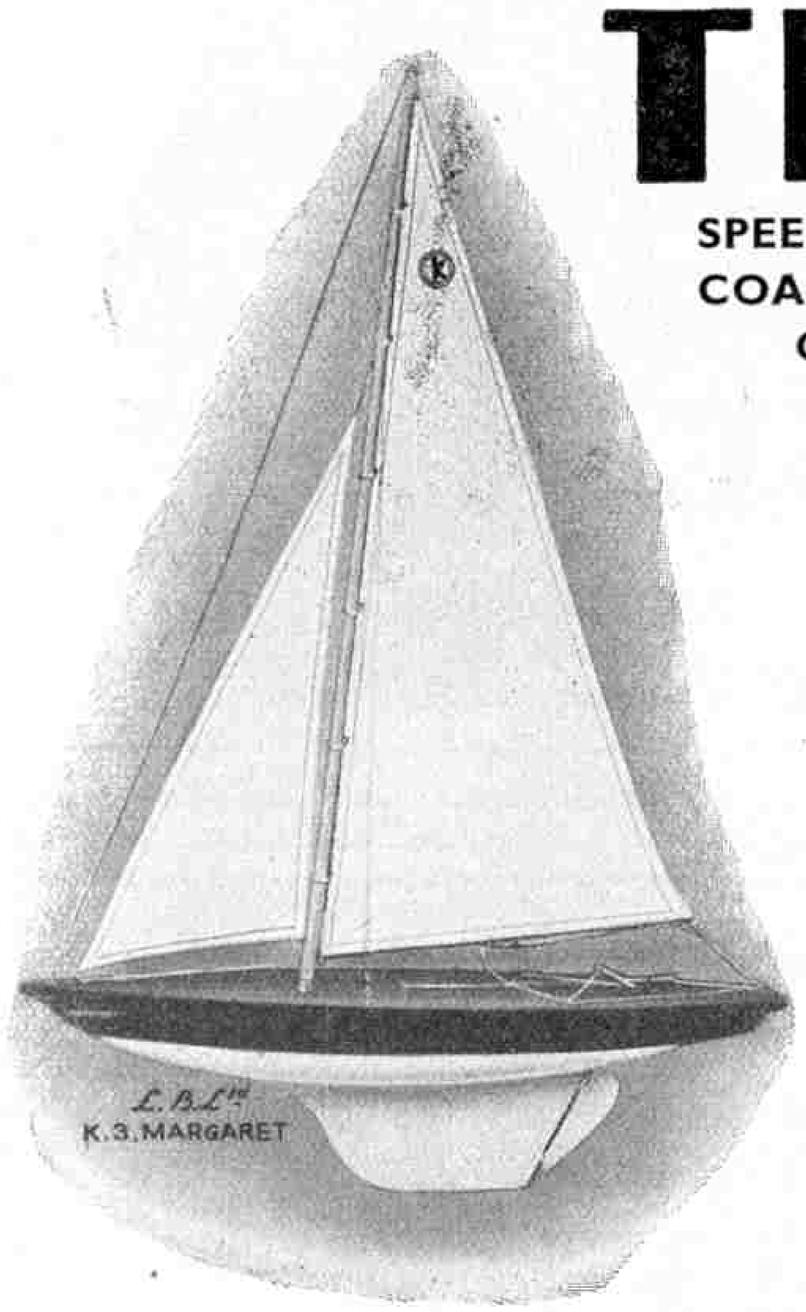

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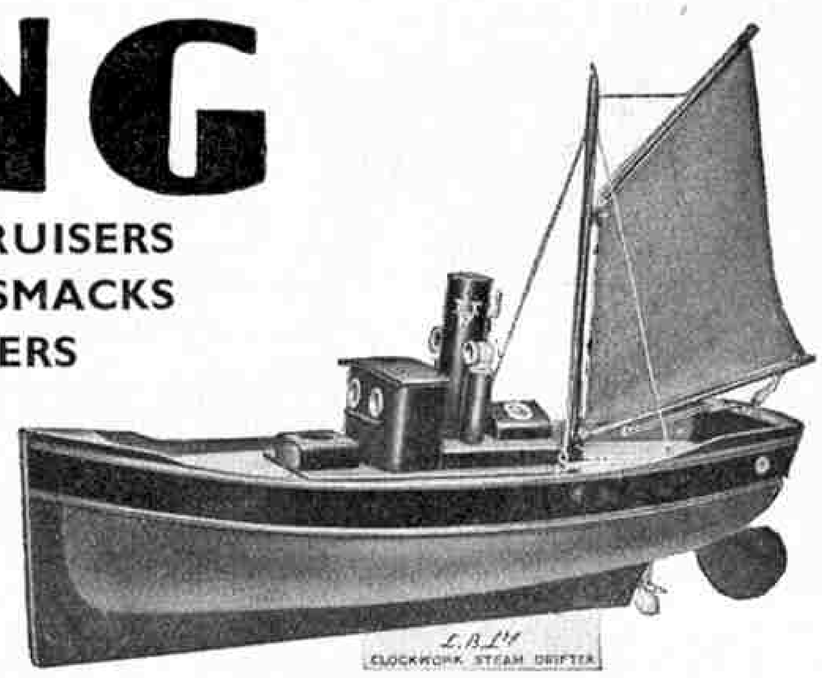

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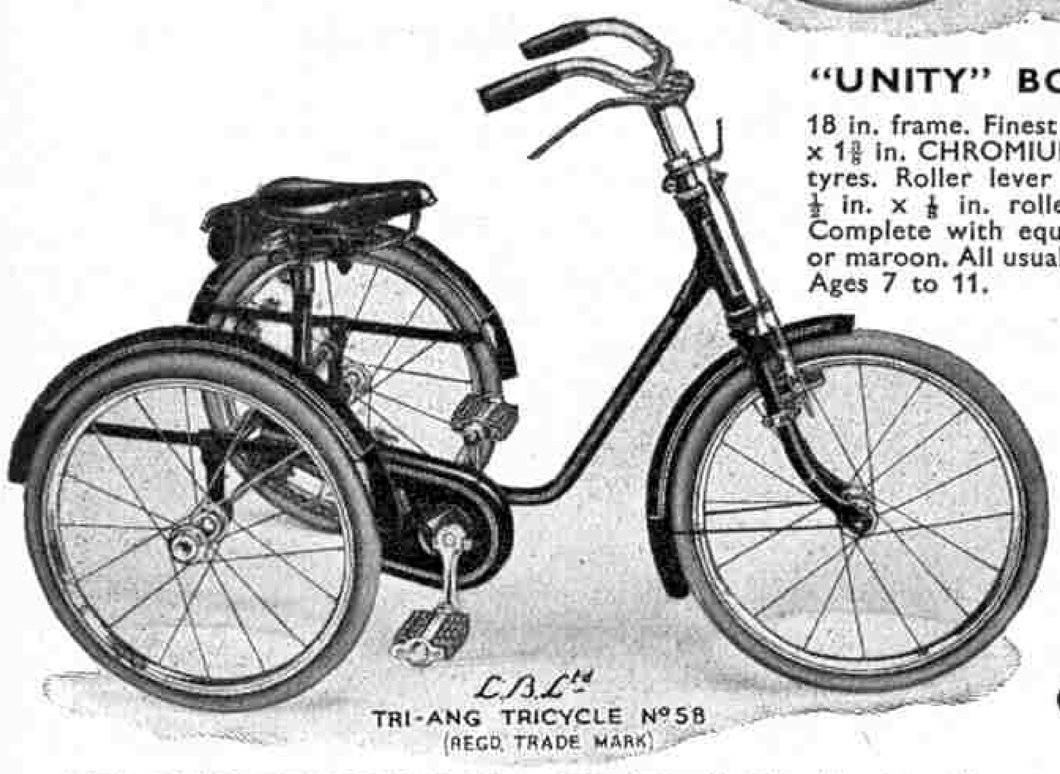

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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXIV. No. 3
March 1939

With the Editor

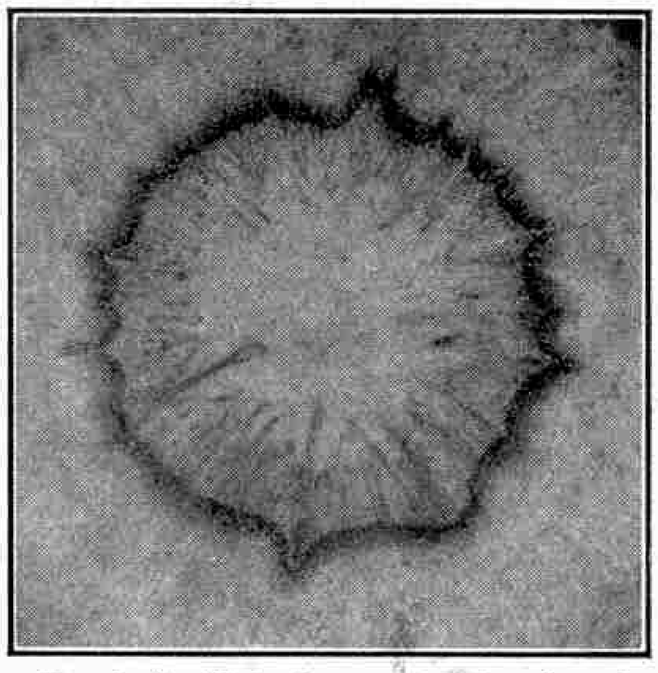
Illustrating Your Hobby by Stamps

The letters I receive day by day from all parts of the world are of great value in enabling me to keep in close touch with the interests of my readers. Generally speaking, these interests centre steadily round certain subjects. They include engineering in all its branches, notably big civil engineering undertakings, railways, ships, aircraft and motor cars; new machines and inventions; scientific discoveries, and the creatures of the outdoor world. There are other interests, however, of a specialised kind, such as stamp collecting, which maintain a very wide popularity.

Mention of stamp collecting reminds me of a new development that I have noticed in my letters during the past few years. This is the use made of stamps by readers who are not actually stamp collectors in the ordinary sense, but who find stamps of interest and value as illustrations of their special hobby. For instance, aviation enthusiasts have found that stamps provide a splendid collection of pictures of balloons, airships and aeroplanes; while others interested in land transport can find stamps illustrating railways, motor cars, bridges, roads, and the quaint methods used in primitive countries. Ships, too, are fully represented, and birds and beasts of all kinds are specially well provided for. This kind of stamp collecting forms a very attractive hobby, and the extent to which it has already spread is shown by the issue by Stanley Gibbons Ltd., of a series of shilling books dealing with stamp collecting by designs, which I strongly recommend to readers.

Readers who consider the possibilities of illustrating their favourite hobby with stamps need not be deterred by considerations of cost. The great broadening of the interest of stamp designs is of comparatively recent development, and the stamps have been issued in sufficiently large quantities to ensure that their prices still remain at a figure well within the reach of every pocket.

Mystery Photograph No. 3



Here is the third of our new series of puzzle pictures, in which ordinary things that can be seen every day are shown from unusual angles. I will present a copy of my book "The Modern Book of Ships" to the sender of the first correct solution that reaches me.

Solutions must be written on postcards only, and addressed "Editorial Competition No. 3," "Meccano Magazine," Binns Road, Liverpool 13.

Mystery Photograph No. 2

Mystery Photograph No. 2 that appeared on the Editorial page of the February "*M.M.*" proved a great teaser, and only one of the hundreds of readers who sent in solutions realised that it was a top view of an office gum bottle, with the lid and brush slightly out of place, as they are often seen during use. This keen-eyed reader was Alan Jones, Sunderland, and I hope that he will enjoy reading the copy of my "*Modern Book of Engineering*" that I have sent to him as a reward for his astuteness.

Many readers were amusingly wide of the mark with their solutions. Some thought the picture showed a golf ball cleaner, and others saw in it a front view of a Yale pattern lock, and even a chess pawn. The most startling idea was that it was a view of a lighthouse as seen from an aeroplane! By far the greatest number of entrants imagined they saw a picture of an electric light switch with the cover loose and slightly out of place.

Regular Orders for the "M.M"

I have received a large number of S.O.S. letters from readers who were in distress because they were unable to secure their copies of the January and February issues from their usual dealer or newsagent. These readers have never placed a regular order, but have trusted to being able to obtain a copy without difficulty on the first of each month. The demand for the January and February "*M.M.*" was so great, however, that suppliers were quickly sold out. Once more I draw readers' attention to the advisability of placing a regular order. By doing so they will be helping me as well as guarding against disappointment to themselves.

For the benefit of new readers I take this opportunity of pointing out that the "*M.M.*" can be ordered from any newsagent or Meccano dealer. Arrangements can be made for the Magazine to be delivered to the home on the first of each month, but readers who secure their copies through Meccano dealers generally prefer to call for them.

Thrills of a London-Capetown Drive

Car Survives Crash from River Bridge

By T. R. Robinson

THE Trans-African Road Survey trip, by which the 18/85 h.p. Wolseley car driven by Mr. H. Symons and Mr. H. B. Browning set up a new record of 32 days from England to Capetown, was certainly one of the most remarkable transcontinental journeys ever made by a motor car. Even if such a trip goes exactly according to plan, it can be relied upon to provide thrills in plenty, but to put up an outstanding performance in the face of such accidents and mishaps as those that befell this expedition is a really wonderful achievement.

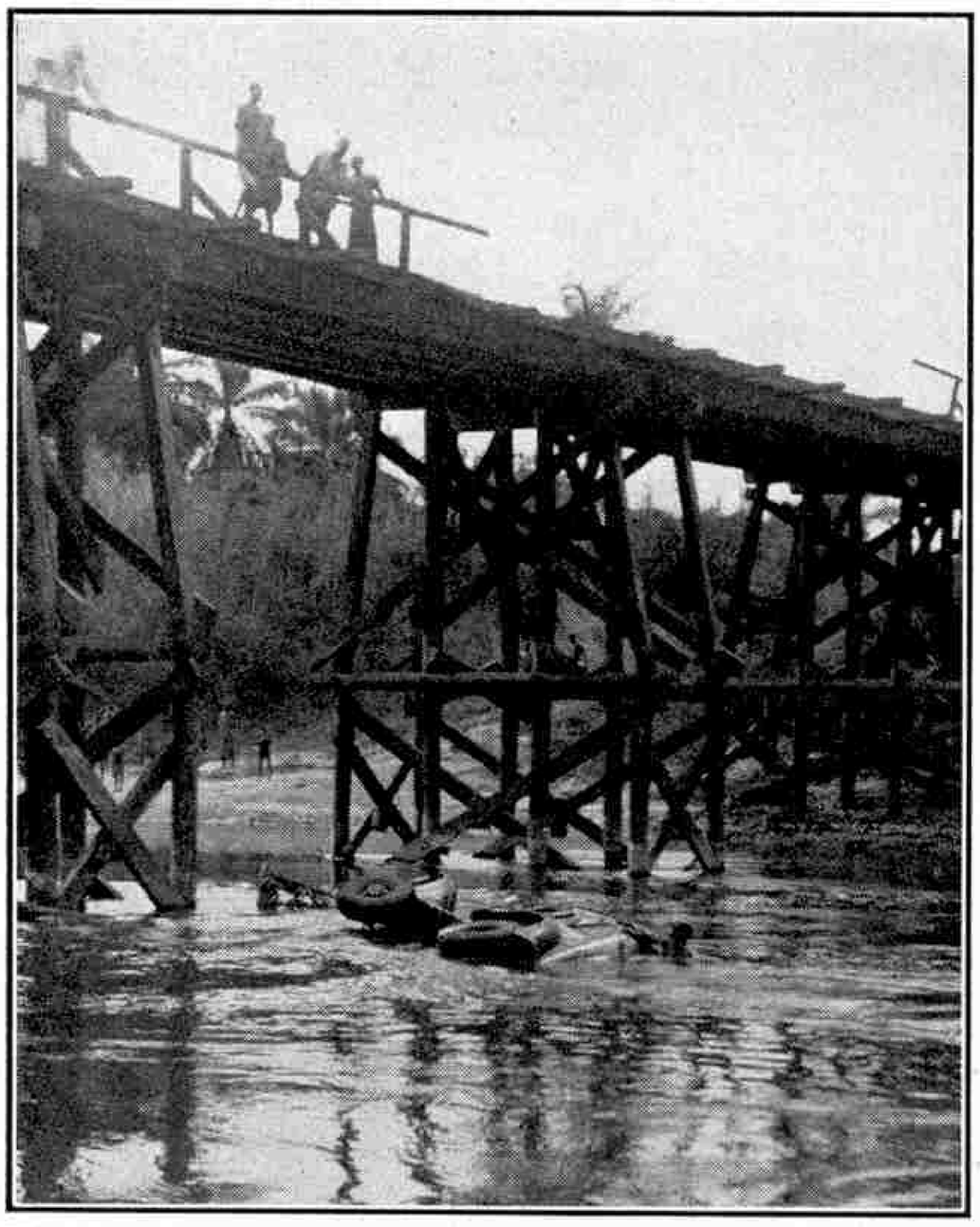
The car used for the trip was a standard model, but was provided with special fittings to make it suitable for its arduous task. The seats were constructed to unfold and form beds, and the opening of the sunshine roof was fitted with mosquito-proof wire netting to allow it to be opened in tropical areas.

Special sun-visors and a roof painted white to minimise heat absorption were further features, and a set of extra-low pressure tyres, chains, expanded metal channels and a length of flexible wire track ensured that the car would be able to get a grip on any surface likely to be met with.

The top of the bonnet was pierced with four rows of louvres, with the dual object of preventing freezing of moisture on the windscreen in high altitudes and keeping the engine cool in tropical regions. As water supplies, both for the car and its passengers, were matters of great importance, two five-gallon tanks were fitted inside the body, and an additional tank built into the nearside front wing was designed to receive any overflow from the radiator if the water in the latter should boil. The water was cleverly syphoned back into the radiator as it cooled down again.

Blinds of a special type, adjustable to any angle to counteract the oblique rays of a rising or setting sun, were fitted to all the windows, and as an additional provision against eye-strain antiseptic eye-lotion and an eye-bath were fitted in a handy position in a door pocket. Spare plugs and a change-over ignition-coil were carried, and as the fracture of a road spring was not an impossibility, spare springs were included in the equipment. An interesting fitting on the instrument panel was a thermometer that gave a reading of the temperatures at top and bottom of the radiator. In some of the climatic conditions met during the journey, this instrument proved very valuable.

All such items of the electrical equipment as the dynamo, starter and coil were enclosed in waterproof covers made of oiled silk, so that the fording of quite deep water could be carried out without risk of a breakdown. As an additional safeguard, a length of flexible piping that could be used to bring the end of the exhaust-pipe above the surface of a stream, was included. Both these details were very necessary precautions as things turned out!



The 18/85 Wolseley car in the river at Niangara in Central Africa, after its 50-ft. fall from the bridge in darkness during a tropical rainstorm. Photographs by courtesy of Wolseley Motors Ltd.

A really novel detail was a soup-heater, so made that a tin of soup could be placed in it and heated by the exhaust of the car as it travelled along. A small searchlight, a radio set, a compass, and a very complete outfit of instruments also were carried.

A start was made on the journey on 24th December 1938 in very bad weather conditions. The car was driven to Folkestone, and shipped to Boulogne, and in the subsequent drive across France, typical Monte Carlo Rally conditions were met with, including heavy snow on the mountains of Central France, and mists and fogs in the Rhône Valley.

Arriving at Marseilles, the travellers and their car crossed to Algiers by the fastest steamer, the voyage being described in a cable home as "awful." Freak weather conditions continued to dog the expedition in North Africa. A wide detour was necessary in the Atlas Mountains to avoid snow-blocked passes, and in the Sahara Desert area, one of the driest spots on earth, heavy rains had occurred, washing away such track as there was and leaving only a series of boulder-strewn gulleys that had to be crossed with extreme care.

A queer experience which the travellers met with in the centre of the Sahara Desert was to find a man fishing! According to the fisherman, who was a wireless operator at a lonely station in the desert, there was nothing uncommon about the sight, for he said that fish swarmed in the great underground rivers below the desert surface. He told Mr. Browning that the Sahara must have been a well-populated place in prehistoric times, and showed him some beautiful flint axe-heads that he had found in caves in the neighbourhood. "The Arabs often bring me

arrow heads which they have found lying on the surface of the sand," he added. So apparently the mighty desert was not always as desolate as it is to-day.

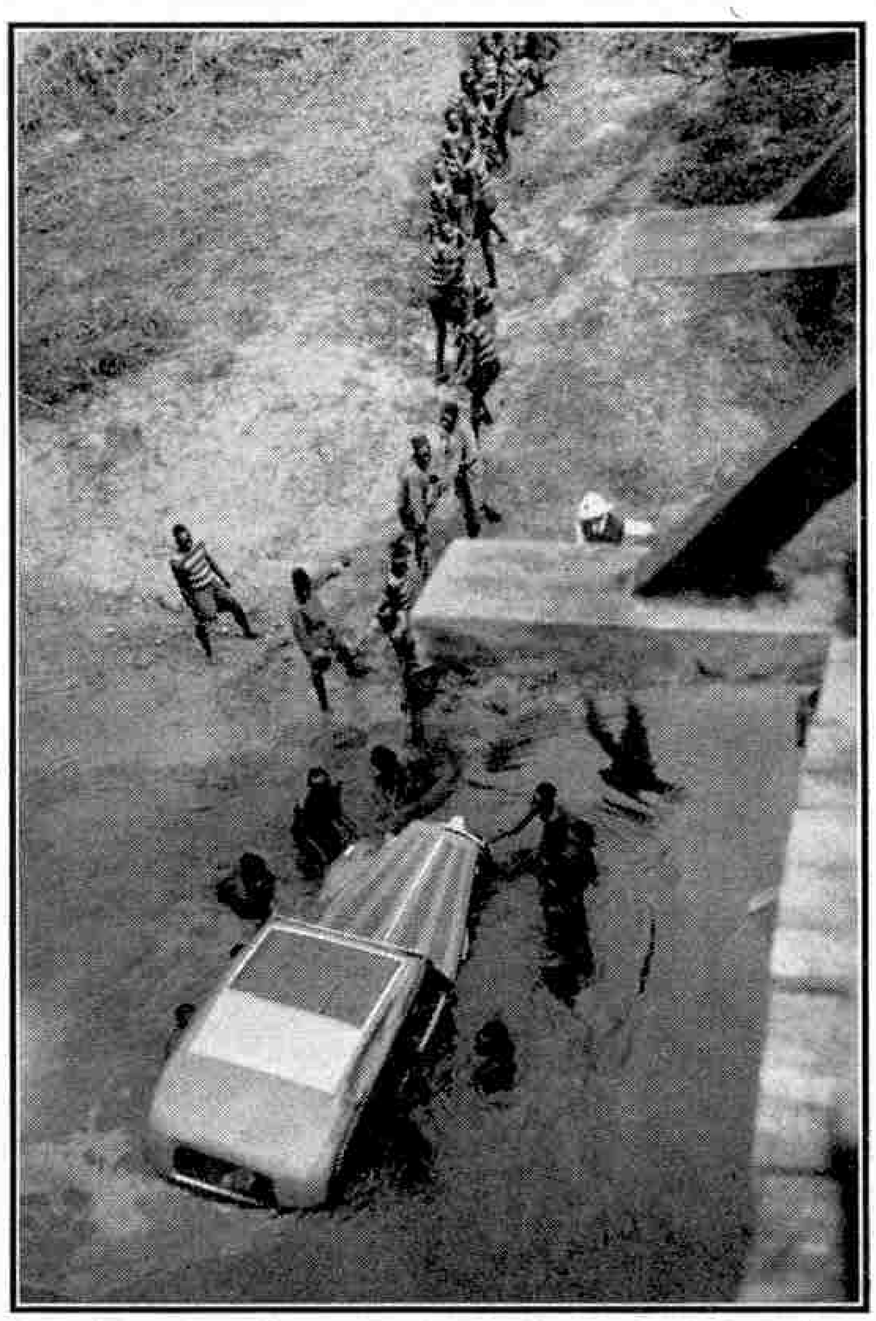
Progress in the desert was slow and tedious, but upon arrival at Kano in Nigeria, on 29th December, it was found that a record had been established for the Sahara crossing, the 2,266 miles from Algiers having been completed in 3 days 4 hrs. 45 min.

At Kano the car was serviced, and the expedition then set off due east for the Cameroons. Further efforts in fairly difficult country eventually brought the car safely across French Equatorial Africa and the Belgian Congo to Niangara, and here an accident occurred that all but brought the trip to an abrupt conclusion.

Pushing forward at night, the travellers ran into a tropical rainstorm, and while this was at its height the car crashed into the railings of a high wooden bridge over a river and fell some 50 ft. into the crocodile-infested water. By good fortune the car fell on its side, and its two occupants were able to get out and swim ashore. Then, in the downpour of rain, they set out to walk to the nearest Catholic Mission station, some four miles away.

At first any idea of continuing the trip seemed ridiculous, and a cable was despatched telling of the disaster, and expressing the belief that the car was wrecked. When native boys had righted the car and hauled it on to dry land again, however, a careful scrutiny showed that, although the body was battered and strained, the chassis was practically undamaged, and the engine and transmission had suffered so little from the impact and immersion that they required no attention beyond inspection and cleaning. Other essential components also showed an astonishing freedom from damage, and although the wings, footboard and bodywork were badly bent, the effect on the car was not by any means so serious as appearance suggested. Accordingly, a start was made for Juba in Anglo-Egyptian Sudan, where repairs were attempted. Two days later a cable home brought the welcome news that the repair work was going on satisfactorily, and on 10th January a further cable announced that the journey was to be re-started at dawn next day. That the engine and the other essential components should have withstood such a crash and yet proved capable of further service was a wonderful tribute to British engineering, for practically all the damage was found to be superficial, and even the accessories and equipment had suffered little harm.

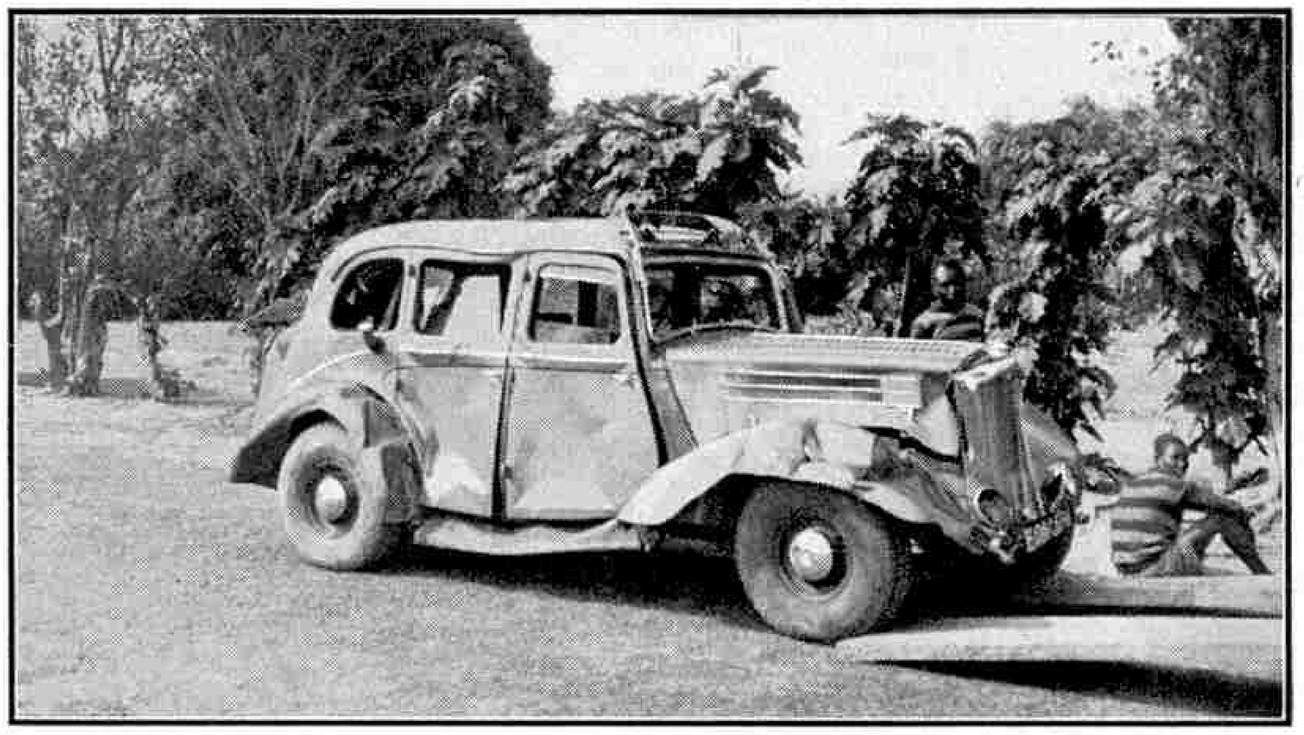
At the same time, the journey was only half completed, and that part of it which still lay ahead promised to be quite as gruelling as that already accomplished, so that the decision to make for Capetown called for great pluck and endurance.



Native "boys" hauling the battered car from the bed of the river.

Nairobi, in Kenya, was reached on the 13th, and from there the expedition pushed on to Dodoma, Tanganyika, arriving on the 16th. South of Nairobi, the travellers found themselves in a country so thronged with wild life as to resemble a gigantic zoo. Frequently they passed within a few yards of giraffes, buffalo, gazelle, deer, ostriches, and even elephants. Apparently the car did not frighten these denizens of the wild, perhaps on account of its very unfamiliarity. After Dodoma it was necessary to drive over steep and narrow mountain passes, where the steering, already difficult, was rendered more dangerous still by layers of slippery mud on the track. Over the border of Rhodesia the road proved all but impassable, and the car had to proceed along flooded wagon tracks and through forests where the grass was often as high as the bonnet.

At one point the car, sliding on a patch of muddy track, went off the road into a swamp, but was got back on to the road under its own power, although this proved a tricky business. Such conditions would have been hard on a car in perfect order, and was a particularly severe test for a vehicle that had been through all that this Wolseley had. No trouble developed, however, and the journey to Broken Hill was resumed.



The Wolseley on land after its fall into the river. Although the bodywork was badly bent, the engine and transmission only required inspection and cleaning before the journey was resumed.

After this the roads improved slightly, and travel was easier, but at Bulawayo an amusing incident occurred. On a muddy stretch of road, two large American cars were found, stuck fast, and the British car, damaged though it was, made a pause to haul them out, a job which it accomplished successfully owing to its additional ground clearance.

After a brief stay at Johannesburg a start was made for Capetown. Although the expedition expected to run into summer weather conditions on this part of the trip, freak weather persisted and tremendous thunder storms sent torrents of water down the mountain sides, making deep pools at frequent intervals, and rendering driving hazardous. The car finally arrived at Capetown on Monday 26th January, and by so doing broke all records for such a journey.

A High Precision Boring Tool

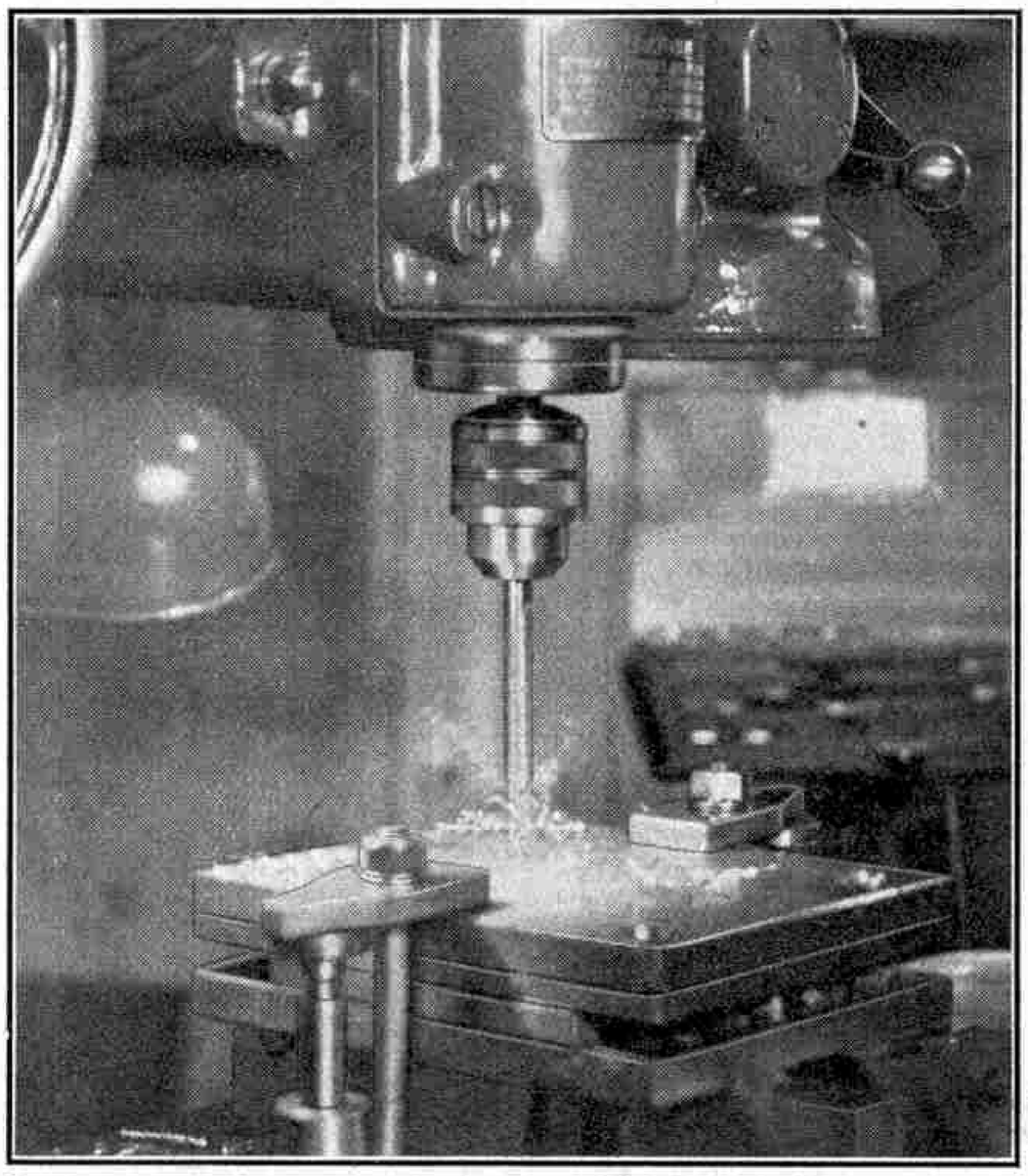
Ensuring Accuracy in Aircraft Production

IT is not often realised how much precision and accuracy is necessary in every modern engineering operation, especially in the preparation of the tools and jigs that are employed in mass production and repetition work of all kinds. A good example of this is to be found in aircraft production, which depends very largely on the use of jigs made with very great accuracy for use in the production of component parts. These ensure that every hole bored is made with the greatest accuracy and at high speed, and that all other shaping or cutting operations are carried through with similar precision, so that lack of accurately-made parts does not hinder the progress of the main assembly, the speed of which is the controlling factor in output.

Our cover illustration this month shows a Pratt and Whitney No. 2A Jig Borer that is a splendid example of the high precision tools now used in industry. This Jig Borer is the latest of its type, and there were very few in this country at the time of the installation of the one shown in the factory of Helliwells Ltd., Dudley, to whom we are indebted for the photograph on which our cover is based. It also is doing good work in Government aircraft shadow factories.

The main purpose of the machine is the boring of holes in jigs that are to be used in the manufacture of parts in which the spacing of the holes must be accurate to a degree that normally cannot be attained. As a rule the machine is operated to limits of one ten-thousandth of an inch, and some idea of the extraordinary degree of accuracy with which it works may be obtained from the fact that the temperature of the room in which it is used must be kept constant by means of a special automatic device. The purpose of this is to prevent expansion or contraction due to variations in temperature during operations, as even slight changes in size would ruin the precision of working.

The adjustments that are necessary in attaining these very fine limits of accuracy are carried out by changing the position of the table on which the work is clamped. The table can be moved both to one side or the other and backward or forward, and a combination of the two movements allows any required position to be reached. Special gauges are first inserted with the object of placing the table correctly, and the final adjustment is then made, the operator moving the table by means of his controls until special dials show that it is in the precise position required. Each of these dials is similar to the face of a clock. There are two of them, one for each direction of movement, and the handle of each points to 12 o'clock when the correct position has been found. A variation of a minute on the clocks is equivalent to a distance of one ten-thousandth of an inch. Thus the operator can easily read the amount of movement required for final adjustment, and the position of the hand in regard to the 12 o'clock position shows in which direction the movement must take place. An additional fitting ensures that vibration of the machine and backlash in the gearing are completely eliminated by a reverse winding of the smaller operating handles of the machine.



A close-up view of the Pratt and Whitney No. 2A Jig Borer shown on our cover. In this illustration the machine is shown carrying out a normal drilling operation. Photograph by courtesy of Helliwells Ltd., Dudley.

The depth to which a hole is bored can be controlled with the same astonishingly high degree of accuracy as its position. This is of special value when a counterbore is necessary. A counterbore is similar to a countersink, except that its sides are straight and the bottom flat, whereas the sides of a countersink slope at an angle of 45 deg. The effect of the counterbore is to give a hole wider at the top than at the bottom, and the depth of bore of larger diameter can be controlled to within the fine limits of the machines working. This is ensured by an additional dial that can be attached to the top of the machine. This dial or clock gives readings of the movement of the drill downward that are similar in type to those of the dials employed when setting the work.

Almost every jig used in the production of aircraft units must be worked to within the limits of accuracy that are attainable with this machine. These limits are made necessary by the high standard of stressing that has been developed by modern aircraft designers. There are indeed certain units produced in the works of Helliwells Ltd. the boring of which cannot be entrusted even to jigs produced by a Pratt and Whitney borer. In these cases the actual part itself passes through this machine. One reason for this high degree of care to ensure absolute accuracy is that with use the jigs themselves are liable to lose slightly in precision.

The operator of a jig borer of such high precision necessarily must be himself a qualified engineer, and the cost of the tool is very high, as will be readily understood in view of the extremely fine limits of accuracy that are necessary in a tool intended for such high precision work.

Crashing a Motor Car

A Drastic Test for an Austin "Ten" Saloon

By T. R. Robinson

TO topple a big saloon car over and over down a steep hillside, at the foot of which it crashes into a road, is about as drastic a trial of strength as could be imagined. An experimental "crash" of this kind was carried out by Austin Motors Ltd. in order to discover how the modern all-steel car body reacts to shock and distortion.

From left to right are shown three stages in the drastic test of a motor car described in this article. The car rolled over several times and crashed into a road, finishing battered but with engine and mechanism undamaged. Photographs by courtesy of Austin Motors Ltd., Birmingham.

The car selected for the trial was a 10 h.p. "Cambridge" saloon, and was a standard vehicle from the production line. No special measures were taken to make it ready for the test, and the radiator was filled with water, the tank with petrol, and the sump with oil in order to make the car resemble as far as possible a vehicle in normal use on the road. The site chosen was a rough slope of earth and grass, with stones and boulders here and there, and was just the sort of surface likely to cause a car to topple over.

At the summit of the hill a wooden platform was erected in a position that would cause the car to face diagonally across the slope and towards some steep inequalities at a short distance. Ramps attached to one end of this platform dropped to the surface of the hill, and so helped to give the car enough momentum to start it on its journey.

The car was run on to the platform and checked over to see that each detail was in order. Then came the great moment. The chocks under the wheels were removed, and with gear in neutral and hand-brake off, the car was pushed from the platform on to the ramps. It rolled slowly away, gathering speed and bouncing slightly as it ran down the rough hillside. The slope had been chosen to give the car a steadily increasing "list," and before the vehicle had run half way to the really bumpy piece of ground it was canting over in a most alarming manner.

On the car went, still keeping on its wheels, although the angle became steeper and steeper, until it crashed forcibly into a heap of stones. It showed no signs of capsizing right up to the instant of striking these, but the severe impact knocked it right over, and then the real test began. Rolling sideways, over and over, colliding with various obstacles on its way, and turning five complete somersaults, it eventually crashed into the road with such force that it rolled over again on the flat road surface, finally coming to rest right way up.

After such brutal treatment, no one would have been surprised if the car had sustained really serious damage, but beyond dented wings, a crushed and battered roof and bent-in corners to the body, it seemed little the worse. The officials in charge of the trial then started their detailed examination. One door was slightly sprung, the windscreen and one or two windows were broken, and other superficial damage could be found in many places, but all the other doors and windows operated as they should, and even the luggage compartment at the rear opened and closed as usual. That the doors showed such a resistance to distortion was particularly interesting, for the jamming of doors in accidents can be very dangerous in trapping passengers.

Tests of the steering and brakes showed that these were in perfect order, and the electrical system and other similar details showed no signs of the tremendous battering the car had received. Most important of all, the main body and chassis structure was not distorted, and there was no mechanical breakage. All the lamp glasses were undamaged, and the wheels and tyres were in notably good condition and had remained in correct alignment.

Romance of Radium

The World's Most Precious Metal

BY far the most precious substance in the world to-day is radium, a single ounce of which is worth as much as 200,000 ounces of gold. It has only been known for 38 years, and is so rare that up to little more than a year ago only just over 1 lb. of its compounds had been separated from its ores, in which it occurs in incredibly small quantities, and the annual production to-day is only a few ounces.

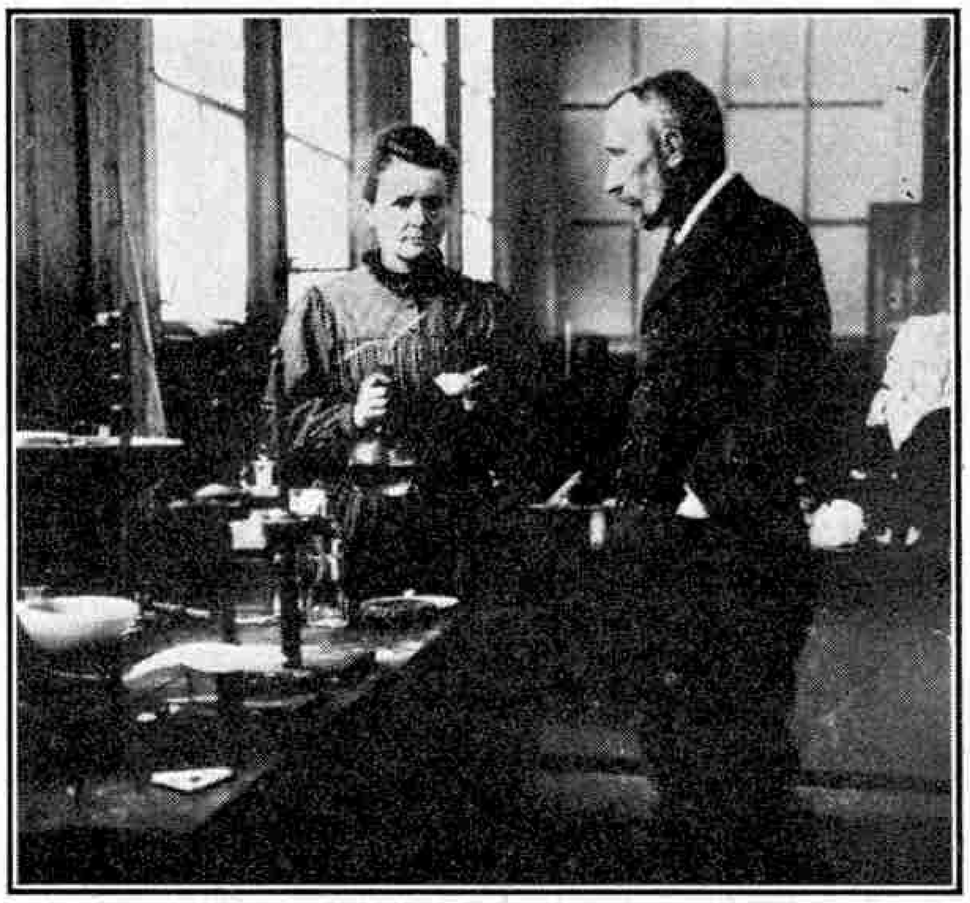
The entire story of radium has been a romance from the very start. Its beginning dates back to the discovery of X-rays in 1895 by Röntgen, a German professor who happened to notice that mysterious marks appeared on developing photographic plates left near a vacuum tube through which an electrical discharge was passed, although they had been protected from light by the usual wrappings. When Röntgen made further experiments he was astonished to find that from his vacuum tube invisible rays streamed out that passed easily through the sheets of opaque black paper in which the photograph plates were wrapped and affected the photographic plates in the same manner as sunlight.

The source of Röntgen's X-rays was then soon tracked down. When a high voltage electric discharge is passed through a vacuum tube a stream of tiny particles called electrons is shot with high velocity from the negative electrode. This stream forms what are known as the cathode rays, which to-day are used in television cameras and receivers. When they strike any solid object the shock produces waves of invisible light of length far less than that of the light to which our eyes are sensitive. To-day specially designed tubes to which voltages of 500,000 and even more are applied are used for producing X-rays that penetrate deeply into the body to attack cancer and other dangerous growths. No hospital is complete without its X-ray department, and this invisible light now finds many uses in industry.

After Röntgen's discovery a search was made for X-rays in other quarters, and among the sources tried were many chemicals that glow after they have been themselves subjected to sunlight. Experiments of this kind were made by Henri Becquerel, a member of a famous French family of scientists, but were failures until a compound of a rare metal known as uranium was tested. This compound laid on a photographic plate wrapped in black paper did affect the sensitive film, even when the compound had not previously been exposed to light. A kind of silhouette of the compound showed itself on development, so that in a sense the piece used in this experiment may be said to have actually photographed itself.

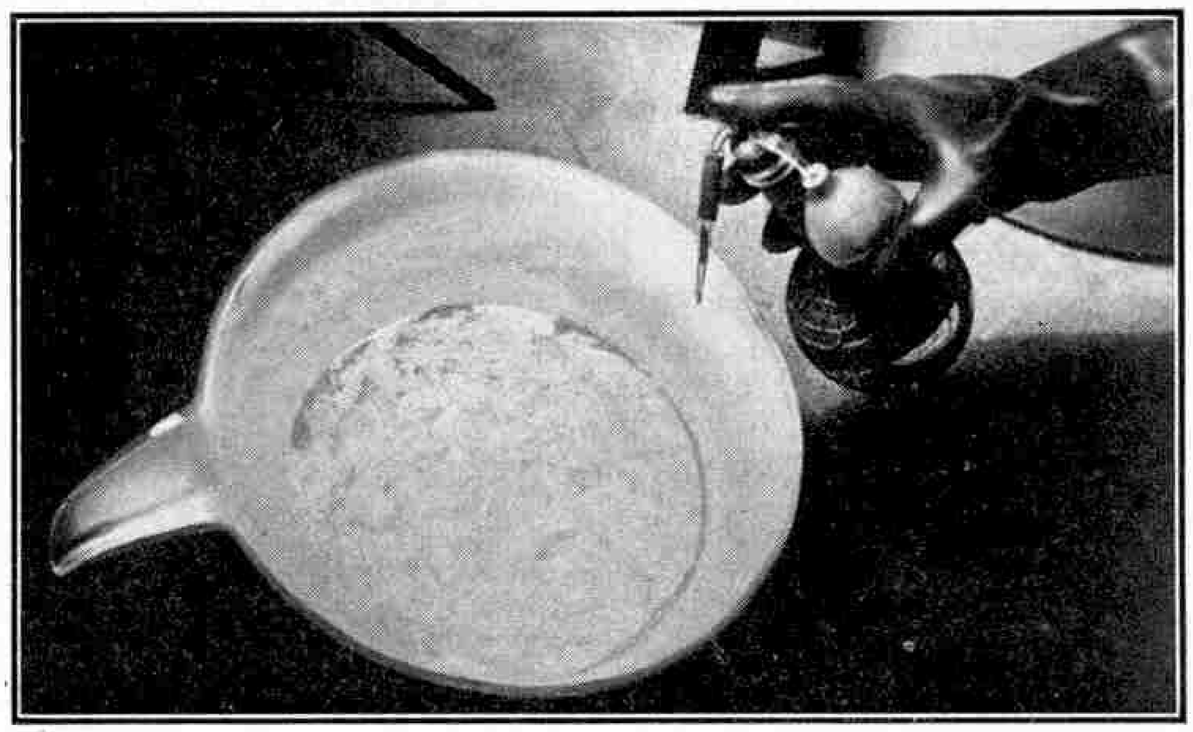
This was an unexpected mystery. Here was a metal that quietly and without any fuss was continually giving off invisible light. The discovery created a tremendous sensation, and was followed by others equally striking. For instance, it was found that the air round a uranium compound became a conductor of electricity.

The story now turns to a Polish girl who had come to Paris as a student of science. Her name was Marie Sklodovska, and in her home in Warsaw, where her father was a teacher of science, she had been seized with the longing to come to Paris in order to study science herself. After nursing this ambition for several years, working as a governess in order to raise the necessary sum of money, she at last set out, crossing Poland and Germany in the lowest and most uncomfortable class on the train. Once in Paris she installed herself in one small room, lived on the least possible amount of food and with scarcely any warmth to sustain her through the winter, and devoted herself with astonishing seriousness to her studies. She impressed all who met her by her capabilities and there was never any doubt that she would make her mark. Eventually she met and married Professor Curie, who was as keenly interested in science as she was herself, and the two made a perfect team for research work.



Professor and Madame Curie in the laboratory in which they extracted the first radium compounds from pitchblende. Photograph by courtesy of the Radium Institute, Paris.

In order to obtain her final qualification it was necessary for Madame Curie to present a thesis giving the results of some original scientific work that she had undertaken. When looking round for a subject she recalled Becquerel's discovery, and determined to follow this up in spite of the difficulties of approaching such a mysterious and entirely novel problem. Conditions also hampered her considerably, for the only room that she could be given in which to do the work was "a kind of store-room, sweating with damp, where unused machines and lumber were put away." Her purpose was to examine as many compounds of uranium as possible, and to measure the intensity of their power to make the air a conductor of electricity. She soon found that this depended only on the proportion of uranium itself in the samples, and then set out to examine every other chemical element in the same manner. By this means she discovered another metal that had the power of sending out the rays. This was thorium, which chemists class as a rare earth metal, and it was at this time that the word radioactivity, now so familiar, came into use, Madame Curie suggesting it for the new property that had been discovered.

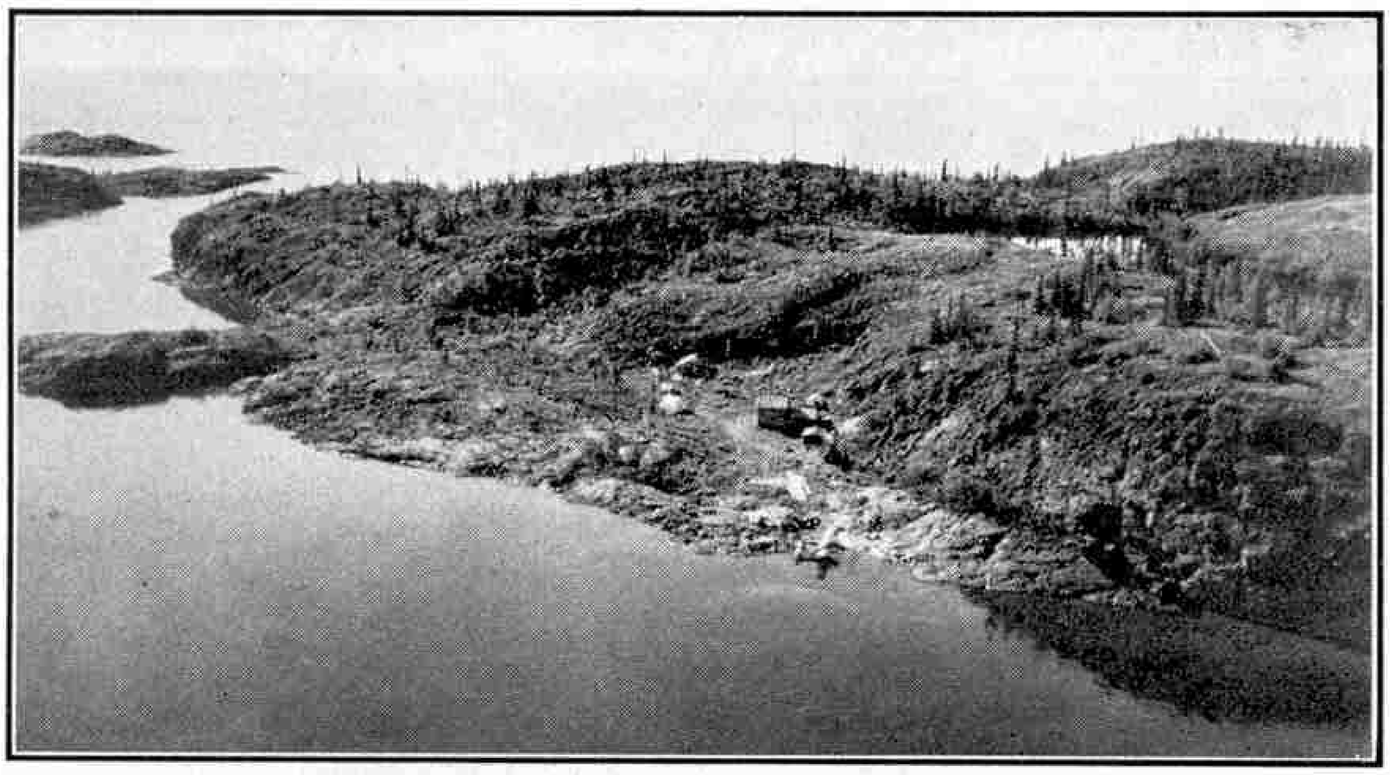


The last stage but one in the refining of radium salts at Port Hope, Ontario. This illustration and those on the opposite page are reproduced by courtesy of Eldorado Gold Mines Ltd., Canada.

Madame Curie was curious to see if the same results would follow the examination of ores and minerals. She expected to find that only those containing uranium and thorium would be radioactive, and this proved to be right, but she was astonished to find that certain of these were far more strongly radioactive than they should have been on the basis of the proportion of these elements they contained. Thinking that she might have made an error somewhere, she repeated all her measurements not once but 10 or 11 times, always with the same result, and then realised that in these minerals there must be something that was much more powerfully radioactive than anything yet known.

If there really were such a new element it must exist in minute proportions, for it had escaped the notice of several generations of

chemists trained to look out for newcomers of this kind, and indeed the most accurate analysis of the minerals seemed to have accounted for every particle, leaving nowhere for the mysterious stranger to hide. Madame Curie decided to look for this very elusive and strongly radioactive metal, however, and in her search she was joined by Professor Curie. The mineral they chose for their effort was pitchblende, which contains uranium, and they set out laboriously to put it through the treatment of the analytical chemist, and then to test every metal or group of metals separated from it to see with which of these the new radioactive element was associated. Then came another surprise, for there were two radioactive parts, one of which attached itself to the metal bismuth and the other to barium in all the tests carried out. For the first of them the name polonium was chosen in honour of Madame Curie's native country, and the other was called radium.



LaBine Point, on the shore of Great Bear Lake, where pitchblende was discovered in 1930 by Gilbert LaBine. The mines at this point are now the world's principal source of radium.

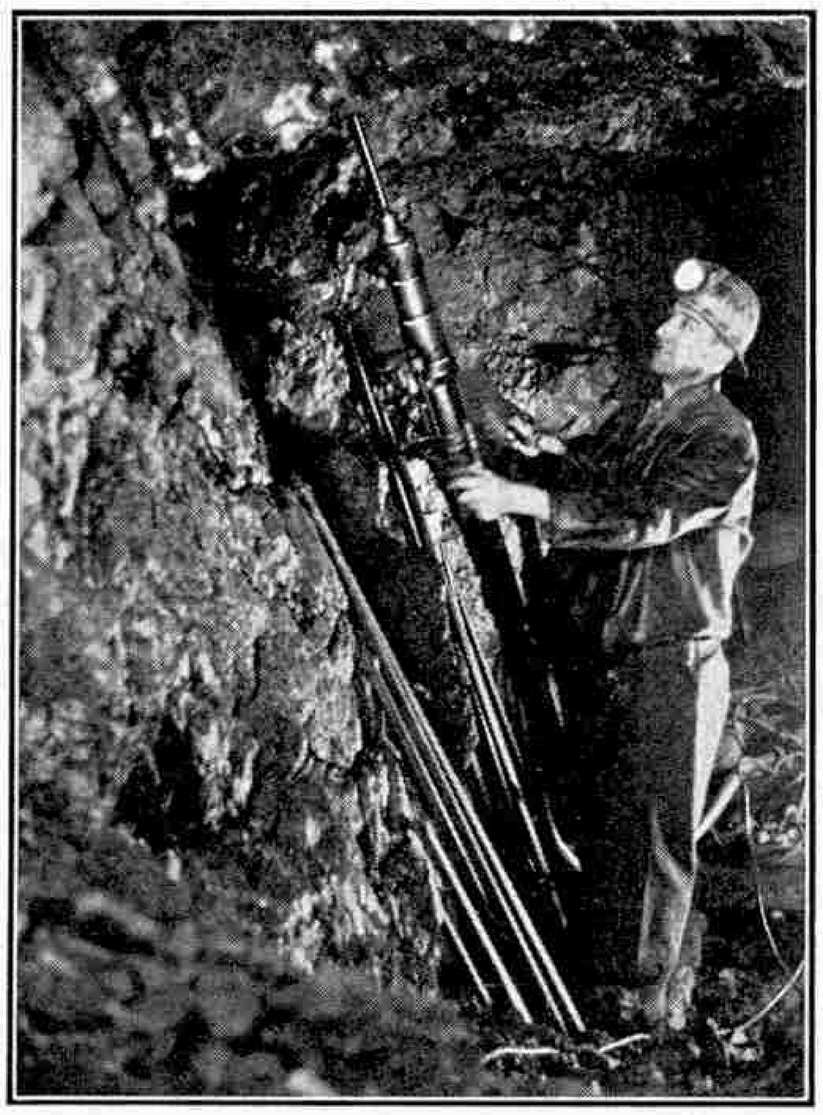
As yet radium was almost a ghost of an element, for all that had been obtained was a compound of barium that had mixed with it a very small proportion of the new element. This applied also to polonium, and the Curies now set out to materialise their ghosts. This was a formidable undertaking, for enormous quantities of the ore would have to be treated in order to get a reasonable quantity of radium. The original sample of pitchblende came from Joachimsthal, in Bohemia, and the Curies had little money to spare to buy the quantity of it that would be necessary. Fortunately there was at the mine a waste dump of pitchblende residues, and the Austrian Government considerately presented a ton of it to the two French scientists, who had only to pay carriage on it.

A place in which to work on the residues was then found. This was an abandoned shed, with a skylight roof, inside which were some worn kitchen tables and an old iron stove. There the precious pitchblende residues were stored when they arrived, packed in sacks like a load of coal. The material turned out to be dull brown in colour, and was still mixed with pine needles from Bohemia, but in it was hidden the precious metal, so well hidden indeed that it was four years before the laborious task was finished. Large quantities of the residues had to be dissolved in acids, boiled, precipitated and filtered again and again. It was this task that Madame Curie chose for herself, and she found it killing work to carry the heavy receivers and to stir the boiling liquids for hours at a stretch. Little by little the contents of her flasks and basins became richer and richer in radium, however, and in 1902 she was able to look at a pure sample of a radium compound. It weighed little more than a three-hundredth of an ounce, but there was enough for her to measure the atomic weight of the metal, the first thing required by chemists of a new element.

On the evening of the day on which the work was finished the Curies wandered back to the wretched laboratory, and entered it in darkness. Long before they had hoped that their discovery would have a beautiful colour. Actually it had something more, for it was spontaneously luminous and the precious particles of radioactive material that they had accumulated were outlined by a phosphorescent bluish glow, and it was this that they had come back to enjoy almost in secret.

The Curies continued their work with radium, probing into its mysteries and those of the radioactive elements generally, of which it was by far the most active. It was found that a tiny fragment of a radium compound is always a little hotter than its surroundings. It is indeed a bomb, for exploding atoms in it shoot out three different kinds of rays. Two of these are deflected in opposite directions when a magnet is brought near them, for they consist of positively and negatively charged particles, the former being protons, which eventually form the rare inert gas helium, and the latter being electrons. The third stream consists of X-rays of very short wavelength. The quantity of radium compounds available was slowly increased and eventually Madame Curie isolated the metal itself, to find that it was silvery in appearance. In 1903 the Curies received the Nobel Prize, jointly with Becquerel, for their discovery, but their partnership came to an untimely end in 1906, when Professor Curie was knocked down and killed in a street accident. A second Nobel Prize was awarded to Madame Curie in 1911.

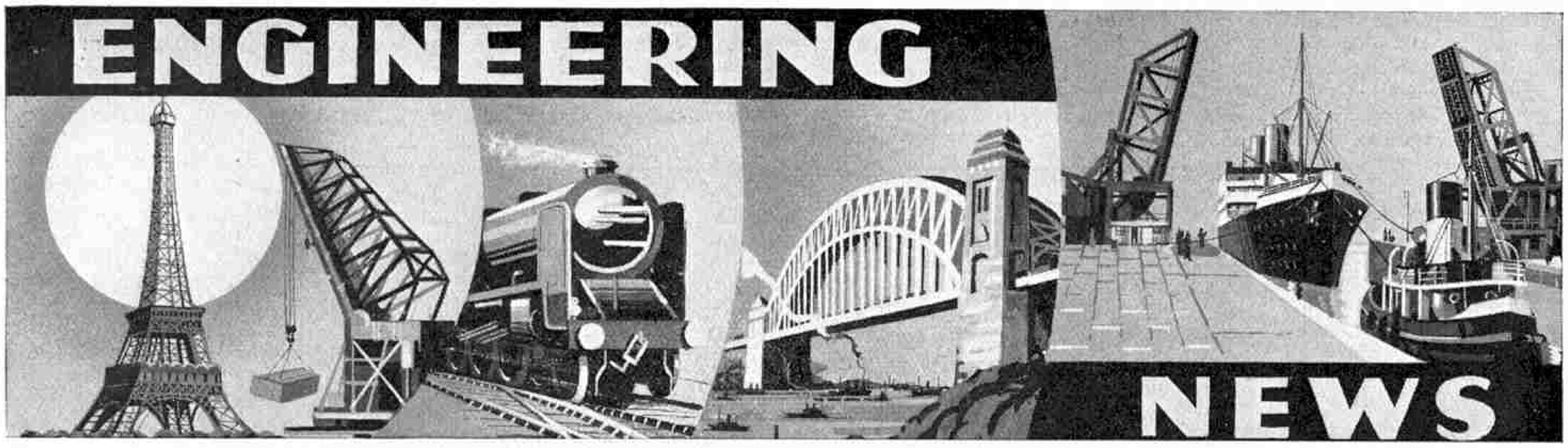
It had soon been discovered that the rays from radium, like X-rays, produce burns on the skin, and then it was found that the radiations destroy cancerous growths. This led to an eager search for sources from which it could be extracted. The first source of supply was Joachimsthal. Then a richer one was found in Colorado, in the United States, but this was displaced by ore from Katanga in the Belgian Congo, and the output from Central Africa held what was almost a monopoly for many years. Then the startling discovery was made of valuable deposits of pitchblende on the shores of the Great Bear Lake, in the far north of Canada and only a few miles south of the Arctic Circle. This ore proved to be rich in radium, and the first ounce it yielded was produced only just over two years ago. An annual output of 100 gr., or about $3\frac{1}{2}$ oz., is now looked for, and the discovery has brought the price of radium down to about a third of its former level.



Drilling in progress in the pitchblende mines at LaBine Point in readiness for blasting.

The man who discovered radium in Canada was Gilbert LaBine, who set out to explore the Northwest Territories as a prospector. LaBine was modern in his ideas, and in 1929 he penetrated into the wilderness of snow and ice by air, a plan that gave him splendid opportunities of studying the ground over very large areas. He was impressed by signs of metals while flying over the shores of Great Bear Lake, especially at its eastern end, and in the following year he made his way there with one companion, each hauling a sledge with a load of about 600 lb., with the idea of examining this likely ground more closely. On a promontory now called LaBine Point the prospector first discovered silver and cobalt, and then found veins of pitchblende.

LaBine was well aware of the importance of this discovery, and sent some of the ore to the Mines Branch of the Canadian Government at Ottawa for examination. The value of this as a source of radium was very soon realised, the only doubt remaining being whether ore so far north and in such inhospitable country could possibly be worked. LaBine himself had no doubts, and with his associates set to work to exploit his discovery. At first most of the work was done by hand, but later machinery was brought in by aeroplane and the kidney-like masses of ore are now drilled and blasted out of the frozen ground. The ore is only concentrated at LaBine Point, and the concentrate is sent to Port Hope, Ontario, for the extraction of its radium, 10 tons yielding a quantity of radium compound about as large as a pin head. In the solutions made by treating the roasted ore with acids and alkalies the precious metal is tracked down by adding barium chloride, the radium then following the barium and being separated with it. The product is a mixture of radium and barium bromides, which is purified by crystallisation.



A Novel Method of Bridge Testing

The illustrations on this page show a novel system of testing bridges that has been used for the first time on a recently-completed bridge across the River Loire at Aiguilly, France. This bridge was built by the Forges et Ateliers Commentry, Oissel, and comprises a suspension span approximately 442 ft. 9 in. in length and two access spans of 56 ft. each.

It was desired to test the bridge with a dead-weight load of 743 lb. per sq. yd. Normally this would have involved the use of a large number of fully-loaded lorries on the roadway, and the distribution of about 100 tons of pig iron over the pavements, and in order to avoid the great expense this would have involved the engineers decided to use water. The surface of the bridge therefore was divided into eight watertight tanks by means of nine wood plank walls, each about 2 ft. high, built across the width of the roadway. The walls were made waterproof by covering them with tarpaulins, which were sealed to the floor and sides of the bridge with plaster. Water was then pumped from the river into each tank in turn until all had been filled. Plugged drain holes were provided in the floor of the bridge to allow the water to be released into the river at the end of the tests.

Water pouring from the flooded roadway of the Aiguilly bridge after the novel water test described on this page had been completed. The photographs on this page are reproduced by courtesy of M. Lambert, Roanne (Loire), France.

A photograph of the flooded roadway of the Aiguilly bridge taken during the tests. The water fills the tanks built on the bridge.

A Working Model Iron Mine

Visitors to the Swedish Technical Museum, Stockholm, are now able to see in operation a splendid working model of an iron mine. The model is situated under the Museum building at a depth of 13 ft. and contains about 330 ft. of passages and galleries, in which about 30 tons of iron ore have been distributed. Iron mining tools and machines are seen in actual use, and life-size models of miners are shown carrying out various operations. Gramophone records are used to reproduce the normal sounds that are made by men and machines working in a real mine. Boring machines can be heard from time to time, then comes a signal for a shot, a warning voice and finally the noise of the explosion echoes through the mine. The model is designed to illustrate iron mining methods and progress during the last 700 years.

Electric Lamp with a Reflector in the Bulb

A new 150-watt Mazda lamp introduced by the Westinghouse Electric and Manufacturing Company has a reflector inside the bulb. It is intended primarily for lighting shop windows, but can be used also wherever a self-contained unit of this character is required. The bulb is flared and is coated on the inside of the flare with a thin skin of brilliantly polished metal, which directs the light from the filament in a powerful beam to wherever it is wanted. The lamp is equipped with a medium screw base that fits into an ordinary socket, and is available for 110, 115 and 120 volt circuits.

Britain's First Gas Grid

The United Kingdom Gas Corporation, which controls 73 gas undertakings in various parts of the country, is to lay down what will be the first gas grid in the British Isles. The purpose of the scheme is to produce coal gas of pure and consistent quality by the most economical methods, and to supply it through pipe lines to various existing gasworks in the area. Each of these centres in turn will supply the grid gas, together with their own output, to consumers in their areas.

The area covered by the scheme is in the West Riding of Yorkshire, and among the towns that will be on the grid are Castleford, Harrogate, Otley, Pudsey, York and Malton. Large gas-producing and purifying plants of the latest design will be erected at selected pitheads, and the first of these is being built at Hemsworth, near Castleford. When completed it will consume more than 200,000 tons of coal a year, and the production of this quantity will employ 570 miners. After being washed the coal will be automatically fed to crushing mills and then will be conveyed in the form of fine dust to a large bunker. From there the coal will pass into the carbonising ovens, and will yield smokeless fuel, coke, tar, benzole, ammonia, and many other valuable by-products as well as gas.

A Great French Water Power Scheme

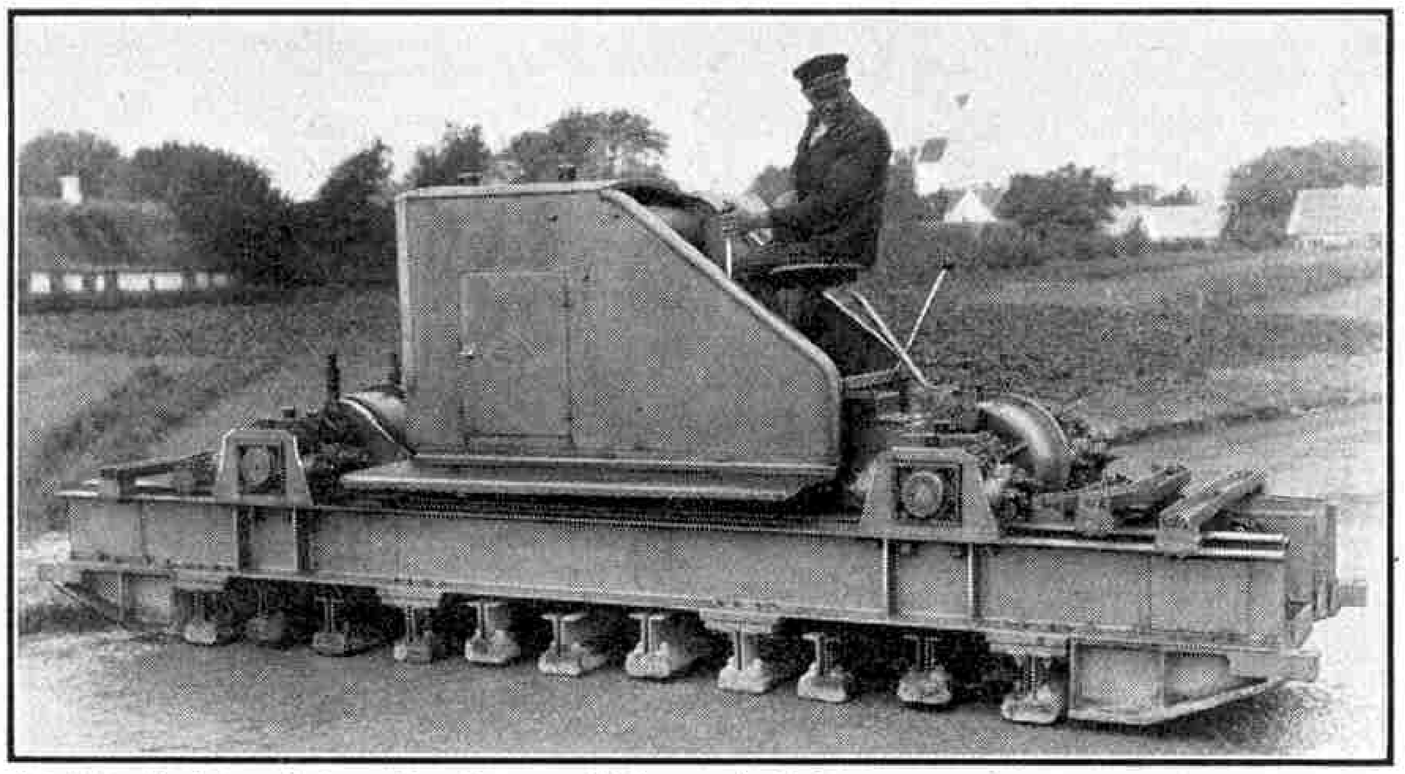
A great artificial lake 14½ miles long will be formed behind a dam now being built across the River Rhone, in France, and will provide water storage capable of producing 1,800 million kWh of energy per year. This tremendous output is considerably greater than that of any hydro-electric station already in existence or in course of construction in Western Europe.

The dam is being constructed in the Genissiat Gorge about 18 miles south-west of Geneva. Its height above the bed of the river will be about 263 ft., and its crest will be more than 360 ft. above the lowest part of the foundations. The work now in progress includes the driving of tunnels in the walls of the gorge. The river will be diverted through these in order to uncover the sites on which the dam and power stations will be built and other works carried out.

Machine to Stamp Down Road Surfaces

The upper illustration on this page shows an ingenious machine for use in road construction, which is marketed in this country by the Sipo Trading Co., Copenhagen. It is known as a road presser, and is intended for use in place of a steam or Diesel-engined roller for consolidating the surfaces of roads during construction. The machine consists of a number of ramming frames each provided with a heavy ramming foot, and they are connected with each other by means of two crankshafts. The crankshafts are operated by the motor that is used for driving the machine backward and forward along the road. When the motor is coupled up the ramming frames are alternately lifted and lowered as the machine travels along, and thus beat heavily on the surface of the road.

The machine is steered by means of two levers, one of which controls its movement to the right while the other steers it to the left. It is claimed for it that one passage over a given stretch of road is more effective than that of a roller run forward and back. This claim is based on the fact that each of the ramming feet in turn strikes every point of the road, while with the roller each point receives pressure only twice.



An interesting stamping machine for consolidating roads during construction. Photograph by courtesy of Sipo Trading Co., Copenhagen.

Telephone that Requires No Batteries

A portable telephone that is operated on power generated by the speaker's voice, and is sufficiently powerful to transmit speech over distances of more than 200 miles, has been introduced by the Western Electric Company. It is known as the "magnetic" telephone and was designed by Bell Telephone Laboratories for use in railway sidings, ships, coal mines and similar places where reliable and portable communication facilities are required.

The secret of operation of the instrument lies in a small but powerful magnet. Small currents are generated by the movements in the field of this magnet of a metal diaphragm vibrating under the impact of the sound waves produced by the speaker using the telephone, and a similar instrument at the receiving end acts in reverse order to reproduce his words. Each instrument is provided with a small hand crank for generating a signalling tone. When the crank is rotated a peculiar shrill note is transmitted, which is of such a pitch that it can be heard in noisy surroundings.

The instrument is very small and compact, and is connected with the lines of the telephone system by means of a waterproof cord fitted at its ends with spring clip terminals.

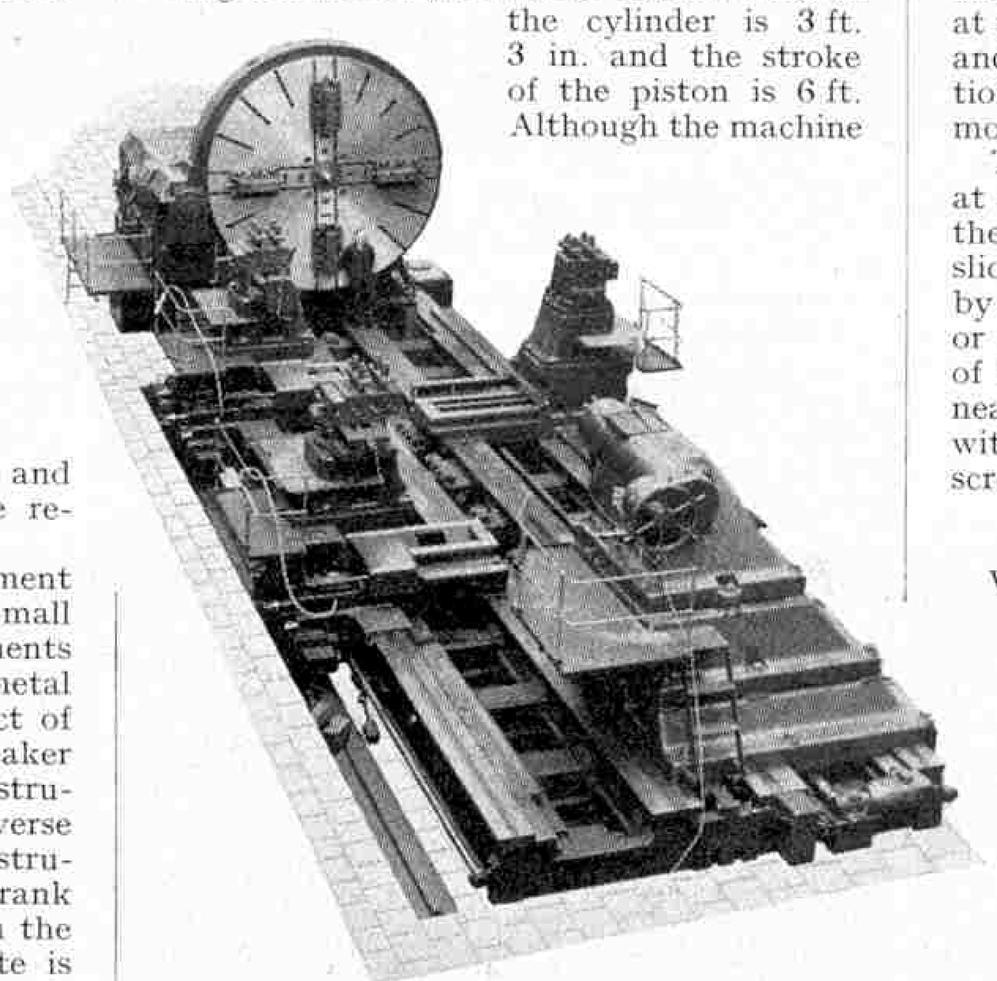
* * * *

A new suspension bridge with a span of 2,600 ft. is to be built across the Narrows of Puget Sound, near Tacoma, on the Pacific Coast of the United States. It will have an overall length of 5,560 ft. and side spans of 1,300 ft., will carry a roadway 26 ft. wide. The estimated cost of the bridge is about £1,200,000.

Giant Steam Hammer for Aircraft Work

A steam hammer built in America and supplied to a large works in this country for forging aeroplane engine crankcases and propellers for British aircraft is said to be the largest of its type yet built. It is 27 ft. in height from the floor to the top of the steam cylinder, and the structure on which the forging anvil is supported extends 12 ft. 9½ in. into the ground, resting there on foundations anchored to bedrock.

The ram, piston rod and piston of the hammer together weigh 22½ tons, and including the top die the total moving weight is more than 31 tons. The diameter of the cylinder is 3 ft. 3 in. and the stroke of the piston is 6 ft. Although the machine is so massive and powerful, the control mechanism is so delicately adjusted that the ram may be brought within the smallest fraction of an inch of the dies at full speed and stopped without making contact.



A giant "Craven" lathe specially designed for machining turbine rotors when mounted on their shafts. An idea of its great size is obtained by comparison with the figure of the man standing near the faceplate. Photograph by courtesy of Craven Brothers (Manchester) Ltd., Reddish.

* * * *

Three generators now under construction for Grand Coulee Dam together will be able to produce enough electricity to light nearly six million 60-watt lamps.

A Lathe that Weighs 230 Tons

The lower illustration on this page shows one of three similar giant lathes that have been built by Craven Brothers (Manchester) Ltd., Reddish. These lathes are among the largest ever built in this country, and have been specially designed for machining turbine rotors when mounted on their shafts. Each weighs 230 tons, has a centre height of 94 in. and will accommodate work up to 32 ft. 10 in. long. The bed is 58 ft. long and 14 ft. 9 in. wide over the shears, and is designed so as to allow the cuttings to fall into a pit in the foundations. A 100-h.p. motor provides main drive, and every movement is easily controlled by merely pressing appropriate buttons.

The huge faceplate of the lathe is 12 ft. in diameter and its four powerful steel jaws are capable of gripping work up to 10 ft. 6 in. in diameter. The spindle to which the faceplate is secured can be driven at eight different speeds. The highest of these is 15 r.p.m., and with the lowest in operation the work turns round once in about three minutes. Any one of these speeds can be selected by means of levers placed conveniently at the front of the lathe. The movable headstock, which holds the work at the opposite end, has a fixed steel centre and steel spindle, and is moved into position along the bed of the lathe by a 5 h.p. motor controlled by electric push-buttons.

There are three tool saddles, two being at the front of the bed and the third at the back. Each saddle has self-acting sliding and surfacing motion operated by hand, and can be moved quickly across or along the bed when necessary by means of its own 3 h.p. motor. The front saddle nearest the driving headstock is equipped with gearing and changewheels for screwcutting operations.

Electric Power Schemes in Russia

Work is proceeding on the construction of a great hydro-electric centre a few miles from the town of Kuibyshev, on the banks of the Volga, in Russia. This is the largest constructional work yet undertaken in the Soviet Union.

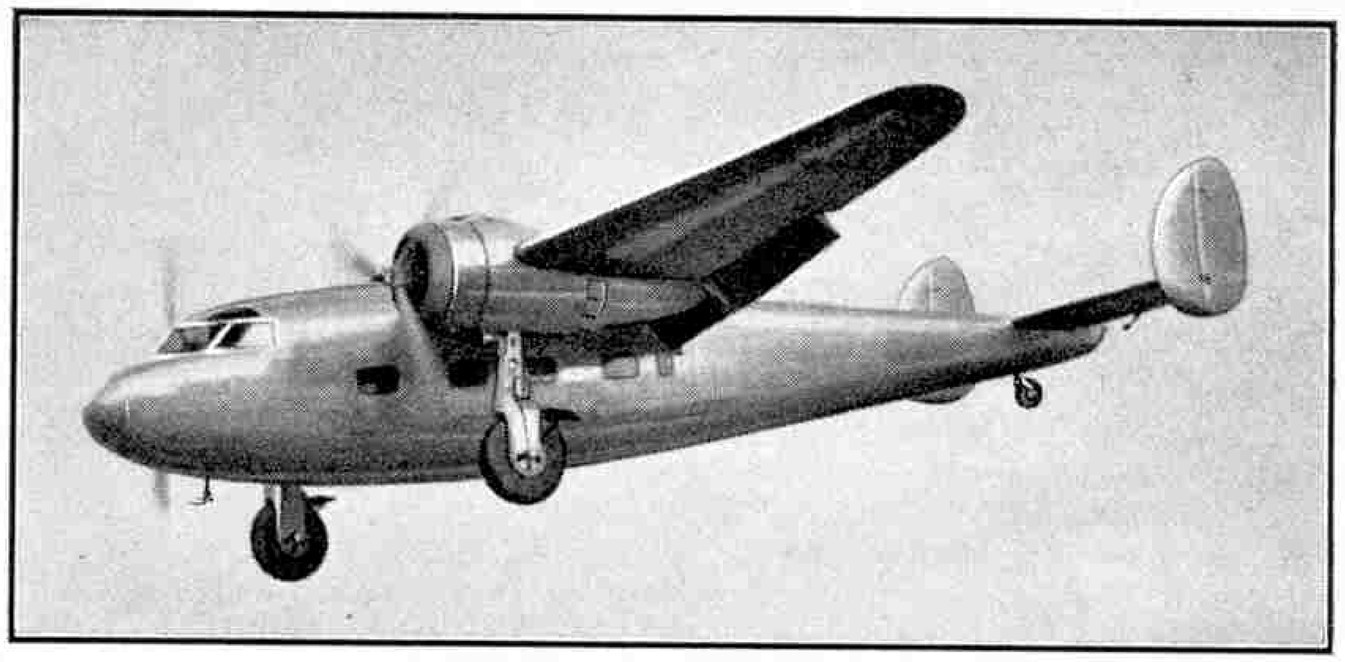
The new centre is the main item in a great scheme of dams and power stations that will create vast supplies of electricity and also will provide ample water supplies to irrigate the arid steppes. One part of the scheme, comprising a dam and power stations at Uglich and Rybinsk, is already nearing completion. These stations will have a combined output of 440,000 kW, but this will be completely dwarfed by that of the new station at Kuibyshev, which will have a generating capacity of 3,400,000 kW.

It is proposed also to link up the Volga and the Don by means of a canal. If this is done the Volga will eventually become part of a deep waterway linking up all the largest water basins of the Soviet Union and providing a navigable route from Moscow to the Caspian and Black Seas, and ultimately to the Baltic and the White Sea.

First Flying Trials of the "*Flamingo*"

The Latest de Havilland Air Liner

I WAS fortunate enough to be at Hatfield on that brilliant frosty morning of 28th December last when young Geoffrey de Havilland stepped into the new "*Flamingo*" air liner with George Gibbins and flew it for the first time. It was a fine thing to see and to remember. I saw the second and third flights, and was privileged to go as a passenger on the fourth flight, 30th December. The "*Flamingo*" had been taxied slowly in the thick snow on 22nd December, and had done a few quick runs on the 23rd when de Havilland had allowed it to leave the ground on three short hops. Next day was Christmas Eve and the weather was bad, and everyone went home to tend to frost-bound water pipes and prepare for festivities, forgetting the "*Flamingo*" until the following Thursday, when the works would open again.

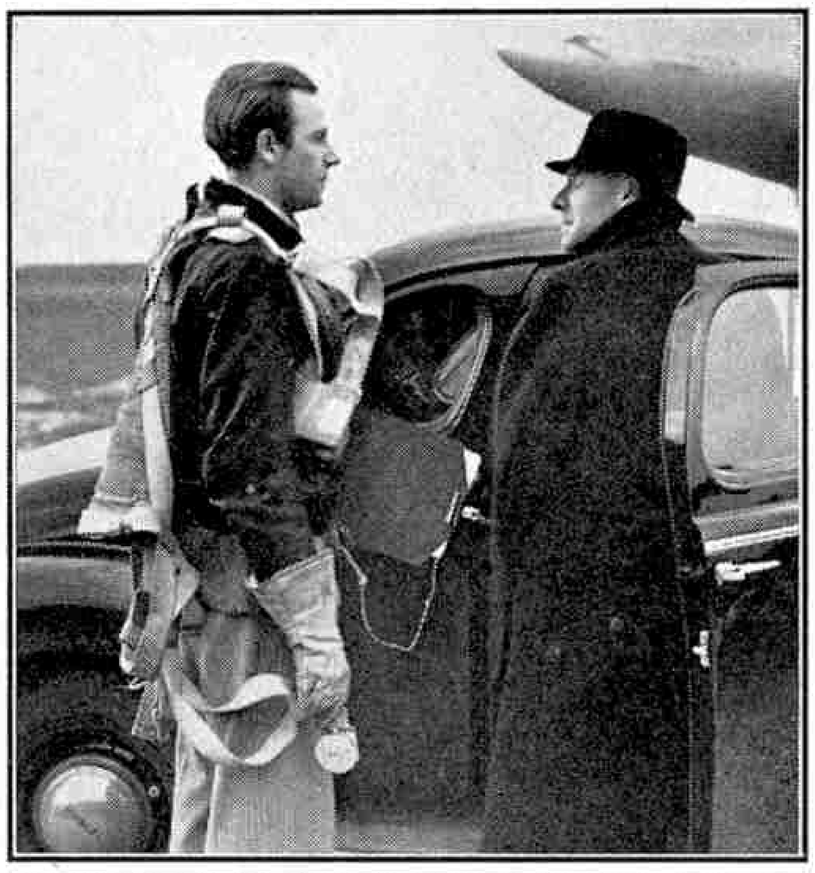


The D.H. "Flamingo" 12 to 20-passenger air liner in flight with the undercarriage down. The illustrations on this page are by courtesy of "The Aeroplane."

But the perfectly cloudless morning of Wednesday was quite irresistible, and a few telephone calls brought a little bunch of people to the aerodrome. The new prototype glistened as her metal form was wheeled out across the snow in the yellow sunlight.

Engines were warmed up and tanks were filled. We expected to see some preliminary runs and hops, but Geoffrey taxied straight from the fuel pumps to the edge of the field, turned into wind, paused only a few seconds, and gave her the gun. I looked at my watch. She left the ground in five seconds and it was just eleven o'clock. What a grand picture! Surely, I thought, five seconds must be wrong. She climbed straight away to the north until she was a speck in the sky and then turned and circled the aerodrome at about 4,000 ft. with undercarriage retracted. Another circuit and she came in to land. Down came the chassis, then the flaps; she glided steeply, flattened out over the clubhouse, skimmed the snow and settled silently down quite close to us. De Havilland said the new ship handled very pleasantly, the acceleration and take-off had surprised him, and he had landed because he thought the oil pressures were on the high side. He was told they did not require adjustment, and he therefore took off again straight away and flew for over half an hour.

On the second flight he made some useful observations which he told us about afterwards. The extreme ease of handling at low speeds and the slow touch-down pleased him, the engine cooling appeared satisfactory, aileron and elevator controls were a bit stiff and one or two normal adjustments were necessary. He was impressed with the acceleration and take-off—but not so impressed, I think, as we were. It was not strictly speaking a working day, and it was bitterly cold; so Mr. A. S. Butler, Chairman of the Company, suggested that the proceedings be adjourned until next morning, and that all the willing workers should forthwith join him in a hot rum punch at the Stonehouse across the road and celebrate an auspicious occasion.



Mr. Geoffrey de Havilland reporting to his father after completing the first flight.

Next day rain fell on the snow from low nimbus cloud and the "*Flamingo*" received a few attentions indoors. Friday broke clear and sunny again, and three hours of serious test flying were successfully carried out. On the first of these Geoffrey de Havilland took Guy Tucker as assistant pilot and Mr. R. E. Bishop as observer. As head of the design office Mr. Bishop has had control of all the design work on the "*Flamingo*," and carries much of the responsibility for seeing that it flies. With him on board the directional control with one engine out was tested and proved better than expected; there was no opportunity just then to test the height maintained on one engine. A number of stalling tests were made, with flaps up and flaps down, cooling gills open and closed, and showed good characteristics and, as G. de H. said, "nothing vicious." This third flight lasted an hour and finished cheerfully with a shoot-up across the pilots' hut at about 75 ft. with 220 m.p.h. on the a.s.i.

Then John Walker, who is in charge of engine flight testing, went aboard for an hour of engine observations at various heights and conditions, and I went as a passenger on this trip. In the cabin, sitting on my parachute, I was first struck by the thrust-in-the-back acceleration, an enjoyable sensation like you get in a really powerful car.

The "Flamingo" on the snow-covered aerodrome at Hatfield before a test flight. The engines are being "warmed up," while other preparations are made. The photographs on this page are by courtesy of "Flight."

For the fourth time I timed the take-off and made it around 5 or 6 seconds from opening the throttles. Of course we hadn't full load; the tanks were full, there were three people and just enough lead ballast to permit changing the C.G. as desired. This powerful acceleration is due to the big reserve power and the big airscrew diameter which reduces the disc loading and increases the static thrust. These big airscrews run at only half engine speed; they keep plenty of wing span and flap in the slipstream. We had the Handley Page slotted flaps at about 25 degrees for take-off. The low airscrew tip speed makes for silence in the cabin and the exhausts go away over the top of the wing. Most of the cooling gills are on the underside of the wing (engine axis being a bit below the chord line), and the advantage of reduced interference over the upper wing surface is felt at high incidences (low speeds) such as when taking off and climbing and in one-engine flight.

I noticed that the throttles were opened firmly and quickly at take-off every time without any tendency to swing. The climb was quicker than anything I had experienced before, for I have never flown in modern military types.

The idea of the big reserve of power for take-off which these fine Bristol "Perseus" engines give is of course mainly one of safety. With modern twin-engine types height attained at a given distance from rest is not such a sound criterion of safety as the time and distance required to achieve minimum safe one-engine climbing speed. This is very easy to understand if you consider the ideal case where reserve power is so great that, should one engine fail at take-off, the aircraft could continue climbing on the other engine, or else land and come to rest within the length of the runway.

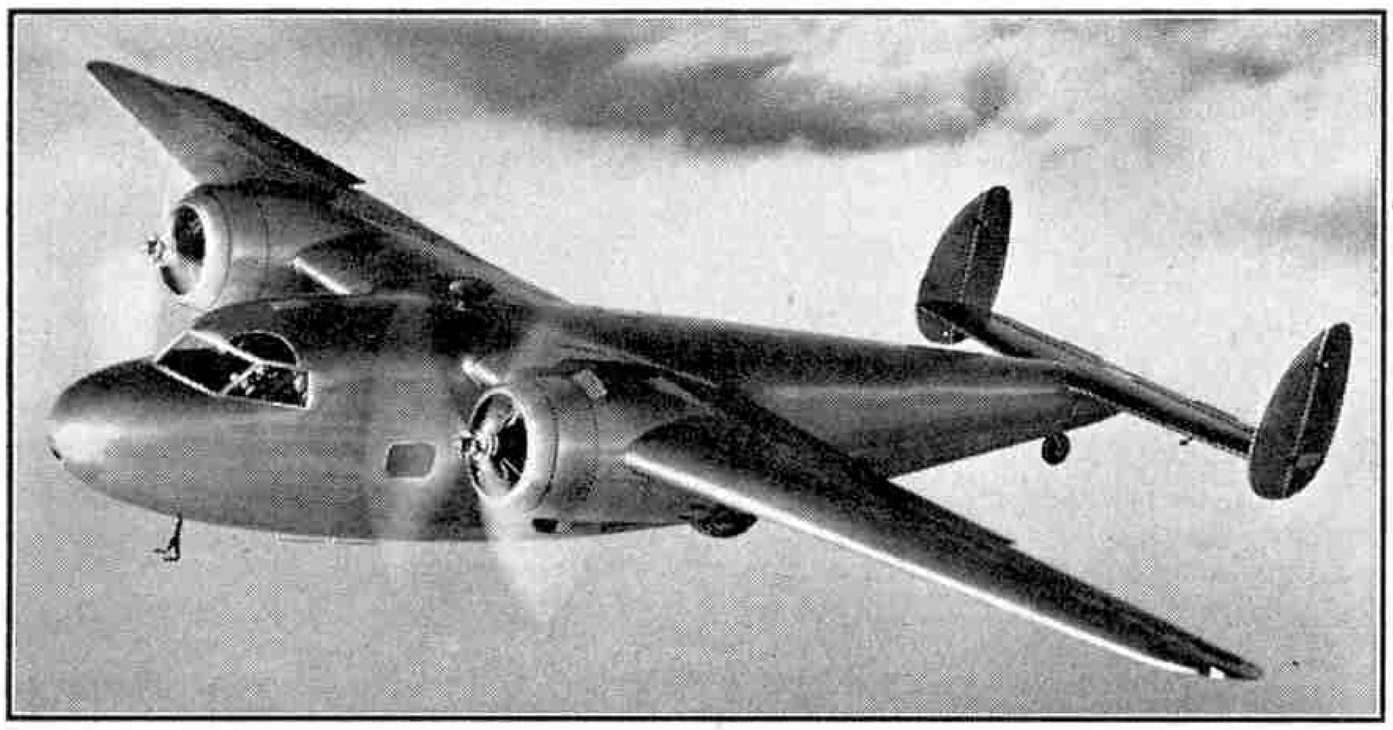
The chassis was retracted soon after we left the ground and I liked its quick and unhesitating action, also its simple design which looked immensely strong.

We turned west at 1,000 ft. and climbed up through about 4,000 ft. of cloud to level off at 8,000 ft. in dazzling sunshine. I began to take note of the cabin details. I see they have fitted double window-panes about $\frac{1}{8}$ inch apart to insulate sound and cold, and the windows are big; the view is of course superbly panoramic. The cabin seems unusually wide and high in proportion to its length—the 12-seater will have only four rows of seats, double seats on the starboard side and single on the port side of the aisle.

The wide fuselage naturally concentrates the load near the centre of gravity and facilitates loading arrangements. The large cabin makes the *"Flamingo"* suitable for short-range duty with a big load (there is space for 20 seats with toilet and small freight and mail compartments), and the tankage, on the other hand, is big enough for fast main-line services—and so is the speed, thanks to a clean form and a well-conceived formula.

You go up two steps into the control room, which is big enough for three people, and underneath it are freight and mail holds. The big luggage room is at the back, and so, as usual, is the toilet room—passengers prefer to walk aft for a wash. The pilot's view is perfect and he has an instantly adjustable seat for taxying, landing, etc., also an adjustable fore-and-aft control column which comes through the dash. When we turned and descended through the cloud we picked up ice very quickly, for the anti-icing equipment has not yet been fitted, and we came out over Westminster Bridge —more wind at height than estimated. We went straight back to Hatfield at 3,000 ft. on cruising boost in six minutes for about 19½ miles against a considerable headwind. The approach was steep, the touch-down seemed slow at about 55-60 m.p.h. and the undercarriage beautifully soft. I had enjoyed myself. We did two more take-offs and climbs and came in. Then the *"Flamingo"* went off again for an hour with Capt. de Havilland, Mr. Murray (Aircraft General Manager) and John Walker. Next day she did another two hours, checking stability with C.G. fully aft and also making a speed course which left Mr. Clarkson, who was on board, smiling at the correctness of his calculations.

Again the pilot spoke of the lateral stability and ease of handling at low speeds. This, I learn, is largely due to the high-wing arrangement which gives an unbroken upper wing surface above the fuselage. M.S.



Another view of the new monoplane in the air, taken during one of its early test flights.

Signalling on French Railways

Interesting Features of a Novel System

By a Railway Engineer

READERS who have travelled any distance in France cannot have failed to notice the signals. The radical difference between the familiar, and to us simple aspects of the British system, and the strange array of coloured chessboards, revolving discs, and other peculiar signs, makes French signalling a little difficult to understand, even by the most careful student of railway working. As in Great Britain the various railways all have their own favourite schemes, which in the case of France are variations of the *Code des Signaux* prepared in 1885. But in the years just after the Great War, when the return of Alsace-Lorraine to France brought with it quite a considerable mileage of railway signalled on the German system, these very diversities were getting a little too much, even for France, and to meet modern requirements an entirely new set of recommendations were issued in 1931.

The new code will eventually bring French signalling closely into line with that of Great Britain and America; it will however be many years before the transformation is complete, and even then the picturesque signs of old will not by any means be superseded. The greatest point of divergence in the past, between the French and British systems is in the "all clear" signal. The French railways have been operated on the principle that no signal at all constitutes "all clear." At night the corresponding sign has been a white light. This in busy yards or in the neighbourhood of towns may easily be lost among a host of other white lights; but the driver not seeing any danger sign, would on the French principle be justified in travelling at full speed.

All this is so radically opposed to British practice, that at first one feels inclined to condemn the whole system out of hand as being unsafe. British engineers have not only insisted that some definite indication must always be given to drivers, but also that in the event of a breakage the danger sign must be shown. It can be argued that with the French system the collapse of a signal or some other mishap might conceivably lead a train to disaster through the driver, in the absence of any indication, thinking he had a clear road. The difference, profound though it may seem, is really one of temperament and point of view however. The Frenchman has always been renowned as an engineer, and even the most insular-minded Englishman cannot refrain from admiring the skill and efficiency with which the French railways are run, even though things are done differently.

It is these very differences that make French signalling such a fascinating study, once that natural prejudice against the all-clear signal has been overcome. There is only one signal in France that when in the danger position cannot be passed in any circumstances, that is the *carré rouge*, or chessboard. This consists of a large board divided into four quarters, two of which are white, and two red. In the "danger" position the chequered face is shown to the driver, and when "all clear" the board is revolved round so that it is barely seen at all, for it is directly on edge. The British equivalent is the ordinary home signal with square-ended arm. At night the *carré* shows two red lights, displayed horizontally on some lines, and vertically on others. In British practice a driver receives only one warning, on passing the distant signal, that he is approaching an absolute stop signal; but on the French railways at least three different signs are passed.

A steel signal cabin at St. Denis, near Paris, with lattice structures bringing signals directly over their tracks. This illustration and the lower one on the next page are reproduced by courtesy of "The Railway Gazette."

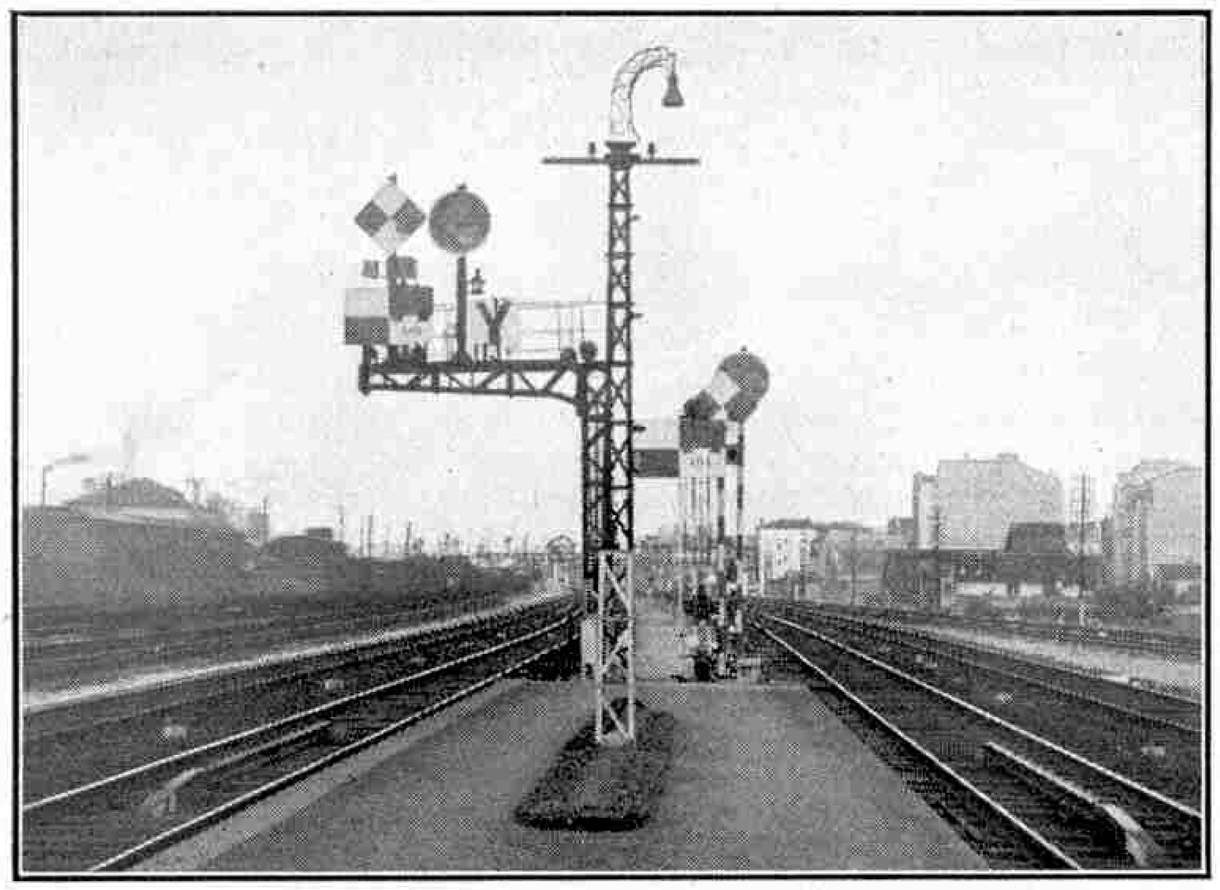
First of these is a red disc; if the chessboard is at "danger" this disc is presented face-on to the driver, and at night two lights, a yellow and a red, are displayed horizontally. If however the chessboard is at "all clear" the disc is revolved till it is edge-on, and from any distance it is scarcely distinguishable. The disc signal may be passed at any speed, but a driver must take immediate steps to get his train under control. The official designation of this signal, of which there is no British equivalent, is "deferred stop."

Nearer the stop signal the train passes a sign that acts as a repeater; this is a diamond-shaped board, now usually coloured yellow, and exhibiting a single yellow light at night. It is however only as a result of the *Decision Ministerielle* of 1931 that yellow is now recognised as the colour indicating "caution." Under the code of 1885, red signified "danger," green "caution," and white "all clear," and until quite recently the diamond-shaped repeaters were coloured green, and showed a green light at night. On some railways this signal took the form of a green and white chessboard.

Last of all, before reaching the red and white chessboard, there comes a signboard having the inscription *Limite de protection*. I have explained that the red disc signal compels a driver to make a deferred stop; this

deferred stop is made just short of the Limit of Protection board, which is usually about 800 metres ahead of the disc. If another train were held up at the red and white chessboard, or *carré rouge*, it is protected from a following train up to the Limit of Protection board. So the complete sequence of signs is, round disc, diamond sign, Limit of Protection board, and finally the *carré* or chessboard. Under the new code although the various boards are all revolved round so as to be practically invisible by day, they all exhibit a green light at night.

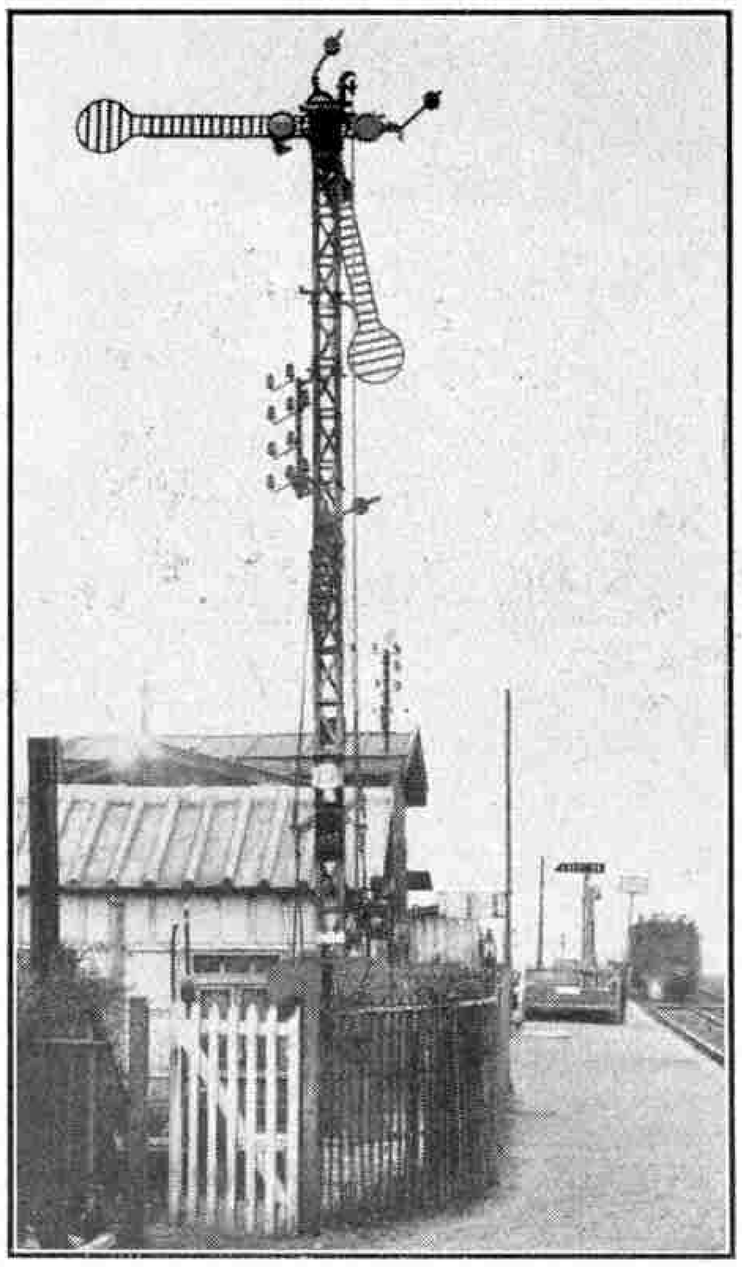
There are no "splitting" signals as we know them in England, and the indication to a driver about to take a diverging route is purely one of "reduce speed." Above the diamond sign, which repeats the chessboard at the actual junction a triangle sign is mounted. When a speed reduction is required this triangle is presented face-on to a driver with the apex of the triangle pointing upward. By night two yellow lights are displayed horizontally.



A selection of French signals on the State Railways. These include the carré, or red and white chessboard, and the red disc mentioned in this article. The ramps in the tracks are for cab signalling purposes. Photograph by courtesy of Mr. T. S. Lascelles.

I now come to the permissive block system that is so common even on the busiest main lines in France. The block posts correspond to the ordinary intermediate signal boxes found on English main lines, and the signal controlling entry to the section ahead is a semaphore, and not a chessboard. This signal must not be passed if at "danger"; a disc gives warning of its position to the driver of an approaching train, and if it is at "caution," then a dead stop must be made at the semaphore.

Supposing the section ahead is occupied; when the last train passed the block post at entry the signalman would have to operate the handle of his semaphore, thus putting it to "danger"; it could not be lowered again until the man at the block post ahead put his semaphore to "danger" after the train had passed his post. But in order to speed up traffic, after a train has once been stopped it is allowed to go forward into an occupied section at a certain definite time interval after the previous train. A written instruction is given to the guard by the signalman, this is shown to the driver, who signs it, and then the train can proceed to the next semaphore. Here even though the signal may be in the "clear" position the driver must stop and wait until verbal instructions to go ahead are given by the signalman.

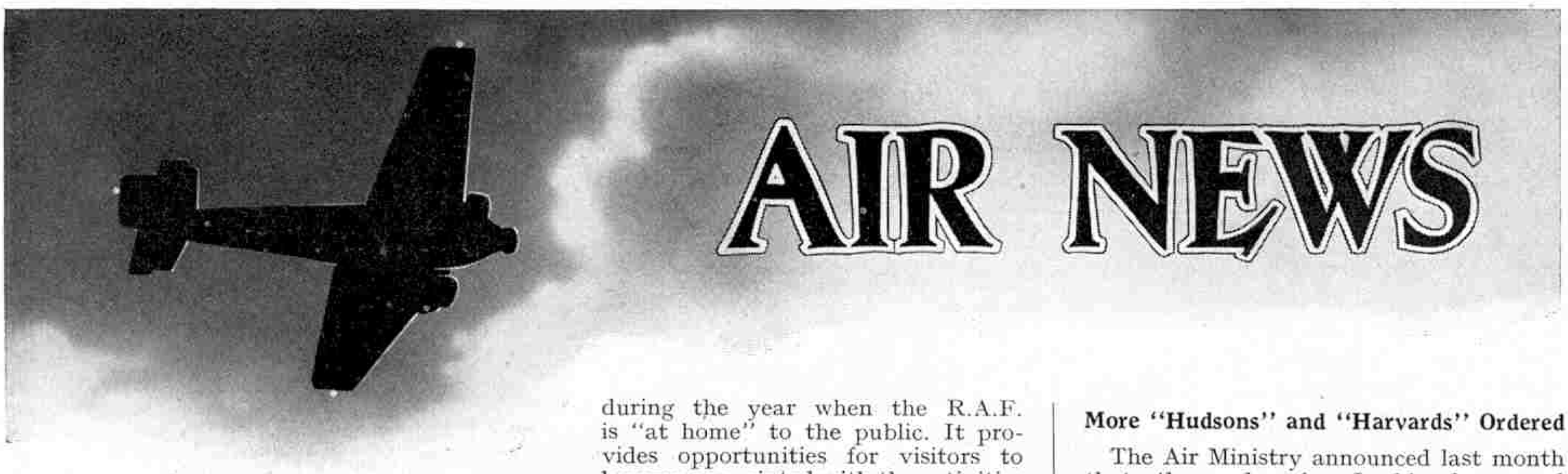


A semaphore block post with one arm in the "stop" position, protecting the train that is seen disappearing. Farther on is a "palette" signal showing "caution."

This all sounds rather complicated and restrictive, as indeed any permissive system should be, but where trains are running in their normal paths, and no out-of-course stops are necessary, the semaphore block system works very simply. Supposing all the signals are at "clear," and an express train passes block post A at full speed, the signalman at A puts his semaphore to "danger" as soon as it is past. This action rings a bell on the semaphore at the next post, B, and also causes a small auxiliary arm to move from the vertical to the horizontal position. This tells the signalman at B that the train has entered the section and warns him to be ready for its passage. In due course it goes by, at full speed, and then this signalman puts his semaphore to danger; this action releases the semaphore at A, which drops to the clear position, and rings the bell to advise the signalman that the train is "out of section."

With semaphore block signalling is combined, on certain routes, an interesting form of cab signalling. This again is entirely based upon the French principle of no signal constituting "all-clear." At each of the warning disc signals a ramp, or "crocodile" as it is called in France, is fixed in the four-foot way. If the disc is at "danger" current is applied to the crocodile, and picked up by a collector brush on the locomotive; this momentary flowing of electric current is made to blow a whistle in the engine cab and thereby warns the driver. In England, on the Great Western Railway, a bell is rung in the cab when a distant signal at "all-clear" is passed; if the signal is at "danger," passage over the track ramp interrupts a local circuit on the engine, causes a siren to sound, and makes an application of the brake. On the Etat system in France many locomotives are now being equipped with continuous cab signalling apparatus, and on such engines a miniature colour-light signal displays a green, yellow or red light continuously, according to the state of the line ahead.

Colour-light signals are now being installed in many places in France, and where interlockings are concerned the shape of the signals and the disposition of the lights look very strange to English eyes. The display boards are made to include all the various combinations of lights seen at a junction, such as the "two reds," and "single green" of the *carré*, and the "two horizontal yellows" or the "two vertical yellows" of the speed restriction signal.



Record Flight to Capetown and Back

Mr. Alex Henshaw, the 24-year old British airman, last month set up a new record of 4 days 10½ hrs. for a flight to Capetown and back. This was more than a day less than the previous record of 5 days 17 hrs. 15 min., achieved by Flying Officer Clouston, R.A.F., and Mrs. Kirby-Green in November 1937.

Henshaw used the Percival "Mew Gull" monoplane in which he won the King's Cup Air Race last year. He took off from Gravesend airport at 3.30 a.m. on 5th February. Brief halts at Oran, in Algeria, Gao, in French Sudan, Libreville, in French Equatorial Africa, where he narrowly missed a ditch in landing, and at Mossamedes, in Angola, and he reached Capetown at 7 p.m. (G.M.T.) on 6th February, having covered over 6,000 miles in 39½ hr., which was 5½ hr. less than the previous record. Henshaw reported that the weather generally had been good, although he had encountered ice-forming conditions over the Mediterranean and fog along the west coast of Africa.

He took off from Capetown on his return flight by the same route at 10.18 p.m. (G.M.T.) on 7th February, and his first halt was Mossamedes, about 1,400 miles north of Capetown. From there he flew to Libreville, and on to Gao. His next call was at Oran, where he landed early in the morning of 9th February and stayed only long enough to refuel, obtain weather reports and drink a cup of coffee. Henshaw left Oran at 7.50 a.m. (G.M.T.) and flew non-stop to Gravesend airport, where he landed at 1.51 p.m. The overall time for his flight from Capetown was practically the same as on the outward journey, and was 17 hr. 27 min. less than the time taken by Flying Officer Clouston and Mrs. Kirby-Green.

The last stage of the return flight was through very bumpy weather, and when Henshaw reached Gravesend he was so stiff and exhausted that he had to be lifted from the aeroplane.

Empire Air Day

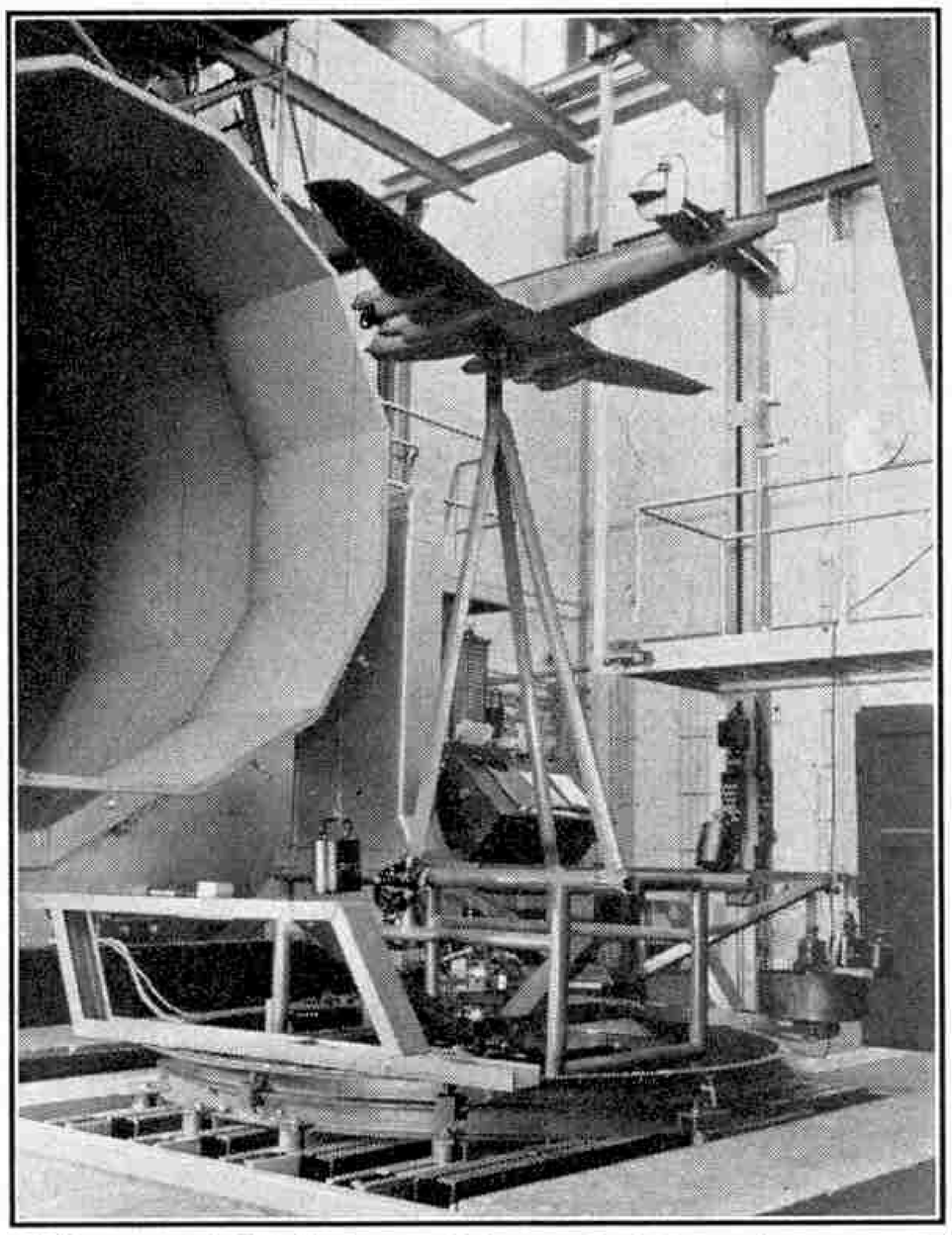
The Air Ministry announce that the sixth Empire Air Day will take place on Saturday 20th May. The steady expansion of the Royal Air Force during the past 12 months will enable more R.A.F. stations to be open to the public on that day than was possible last year.

Empire Air Day is organised by the Air Ministry in conjunction with the Air League, and it is now the only occasion during the year when the R.A.F. is "at home" to the public. It provides opportunities for visitors to become acquainted with the activities of the many varied establishments of the R.A.F. in this country. Record crowds are expected to make the most of Empire Air Day this year.

Australia May Build Military Aircraft

A Mission has been sent to Australia at the invitation of the Commonwealth Government, to discuss with representatives of that Government the possibility of producing there military aircraft of British design. If this can be done Australia will be able to increase considerably the equipment of her Air Force without having to wait for the delivery of aircraft from British factories, which at present are fully employed in meeting the requirements of the enlarged R.A.F. The Mission is being assisted by several technical experts from various branches of the Air Ministry.

Three new squadrons of the Royal Australian Air Force have been formed. The first line strength of the Force is now 132 aeroplanes, and is to be increased to 212.



Testing a model of the Junkers Ju 90 four-engined air liner in the new wind tunnel at the works of Junkers Flugzeug- und -Motorenwerke A-G., to whom we are indebted for this photograph.

More "Hudsons" and "Harvards" Ordered

The Air Ministry announced last month that the order for Lockheed general reconnaissance monoplanes has been increased from 200 to 250, and that for 200 North American training aircraft has been doubled. Delivery of both types has begun. The reconnaissance aircraft will be known as Lockheed "Hudsons" and the trainers as North American "Harvards."

The "Hudson" is a sleek twin-engined, low wing, all-metal monoplane adapted from the well-known Lockheed 14 commercial air liner, several of which are used by British Airways. The military version now being delivered to the R.A.F. is suitable for both reconnaissance and bombing duties, and carries a crew of four, consisting of the pilot, radio operator, navigator, and rear gunner. Details of the armament are not available, but openings for high-powered quick-firing guns are readily visible from the outside, and large bomb doors cover the bottom of the fuselage.

The "Harvard" also is a single-engined low wing, metal monoplane, and is of robust proportions. The two cockpits are arranged in tandem and are covered by a long transparent roof, and a hood can be pulled over the front cockpit when blind flying instruction is being given. The aeroplane can be also used for fighter and bombing training, and carries one fixed gun firing ahead of the machine and a camera gun to record successful shots. There is provision for practice bombs and for a vertical camera to record the results of the bombing.

Air Defence Cadet Corps

The response to the Air Cadet Corps scheme of the Air League of the British Empire continues to be very encouraging. The Corps is now 5,000 strong, the 50th Squadron having recently been formed. One of the "high spots" of the scheme is Greenock, where over 300 boys have applied for membership. The League plan to raise the Corps to 20,000 cadets, or 200 squadrons, by the end of this year. The Corps is the aviation equivalent to the Sea Cadet Corps for which the Navy League is responsible.

The age limits of boys enrolled in the Air Defence Cadet Corps are 14 to 18 years. It is hoped, of course, that most of the Cadets will ultimately serve in either the Royal Air Force, R.A.F. Volunteer Reserve, or the Auxiliary Air Force. The cost of the scheme is met largely by the Air League, as the Air Ministry grant consists of only 3/6 a year for each cadet enrolled. The Cadets learn the elementary principles of aeronautical engineering, the identification and maintenance of aircraft, and other relevant matters, such as the Morse Code.

Lithuania Buys Two Percival Q.6 Monoplanes

Two Percival Q.6 twin-engined monoplanes have been supplied to the Lithuanian State air transport company, Lietuvos Oro Linijos, and the upper illustration on this page shows one of them at Luton airport, ready for delivery. The aircraft were flown from Luton to the airport at Kaunos, the capital of Lithuania, and owing to bad weather the pilots had to fly "blind" most of the way. The Percival Q.6 seats six or seven persons, consisting of a crew of two and five passengers, or one pilot and six passengers. It is fitted with D.H. "Gypsy Six" engines, which give it a top speed of 195 m.p.h. The engines drive D.H. controllable-pitch airscrews.

One of the two Percival Q.6 monoplanes supplied recently to the Lithuanian State air transport company at Luton airport ready to be flown to Lithuania. Photograph by courtesy of Percival Aircraft Ltd.

Aviation Trophy Awards

The Britannia Trophy for 1938 has been awarded to Squadron Leader R. Kellett, leader of the R.A.F. flight that last November regained the world long-distance record for Britain. Readers will recall that two Vickers "Wellesley" monoplanes of the Long Range Development Unit, R.A.F., flew non-stop from Ismailia, in Egypt, to Darwin, Australia, a distance of 7,162 miles. The Trophy is a silver statuette, and is presented annually by the Royal Aero Club for the most meritorious achievement in the air by a British pilot.

In New Zealand the first award of the Musick Memorial Trophy was made recently. It has been presented to Mr. A. Gouge, B.Sc., F.R.Ae.S., the chief designer of the Empire flying boats, in recognition of the proved success of his design. This new Trophy has been created in memory of Capt. Edwin C. Musick, the fine pilot who was in command of the Pan American Airways flying boat "*Samoan Clipper*" when it was lost in the Pacific ocean on 11th January 1938. The aircraft was returning from New Zealand on the first scheduled flight of a bi-weekly air mail service between that country and the United States.

British Military Aircraft for Overseas

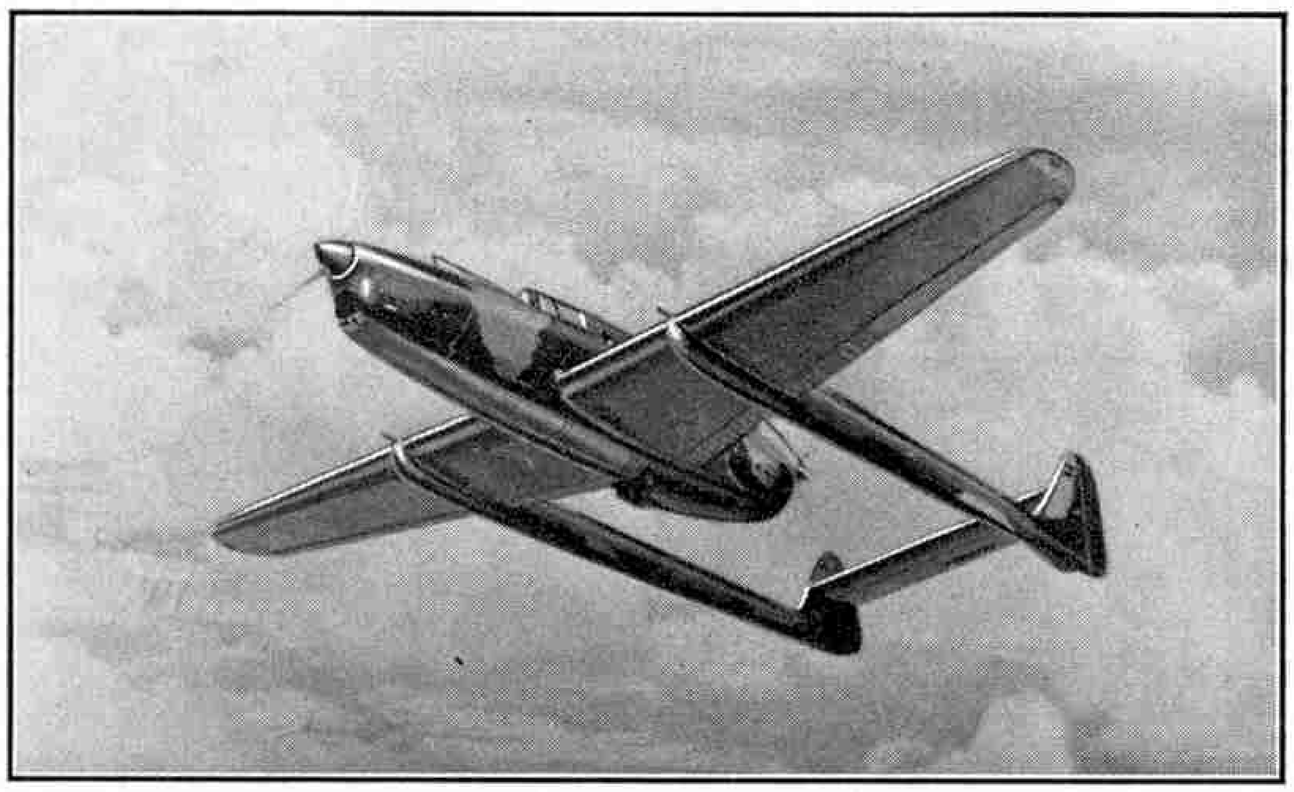
The general efficiency of British military aircraft is frequently confirmed by orders from abroad for one or more of the many types used by the R.A.F. A recent instance is an order from the Portuguese Government for several Westland "Lysander" army co-operation aircraft. This Government have also ordered a further 30 Gloster "Gladiator" 4-gun fighters, and when these are delivered they will bring the total of this type of aircraft employed by the Portuguese Air Force to 45. The new aeroplanes will have Bristol "Mercury IX" engines.

In Denmark a commission of experts has been studying types of foreign aircraft suitable for production under licence in that country. The Fairey P4/34 two-seater low wing monoplane has been chosen, and a contract covering licence rights has been signed with the Fairey Aviation Co. Ltd. This aeroplane was first produced for the British Air Ministry, as a single-engined high-speed bomber, but the P4/34s to be built in Denmark will be a specially developed version for use chiefly as fighters, and the wings will be fitted with special flaps to reduce the speed when the aircraft are diving.

Fast Cross-Channel Flights

Leaving Croydon one morning recently with 11 passengers and a ton of mails and freight the Imperial Airways "Frobisher" class air liner "*Falcon*" flew to Brussels airport in 48 min., at an average speed of about 250 m.p.h. This was a new commercial air-speed record, and beat the previous London–Brussels record by 5 min.

On 16th January last a Supermarine "Spitfire" single-seater fighter, flown by a pilot of Vickers-Armstrongs Ltd., covered the 205 miles from Le Bourget airport, near Paris, to Croydon airport in only 41 min., or at an average speed of 300 m.p.h. The weather was good. On 18th November last year a "Spitfire" was flown from London to Le Bourget in 50 min.



An impression of the Fokker D.23 Fighter in the air. There is an engine at each end of fuselage.

The Latest Fokker Fighter

The lower illustration on this page is an impression of the new Fokker monoplane, the D.23 single-seater fighter, in flight, sent us by our reader J. I. Dorgelo, The Hague. This machine was on view at the Paris Aeronautical Exhibition last November, and much interest was taken in it. It is a low wing monoplane with a short fuselage, and a tail unit carried at the end of two long booms that project rearward from the wing. This wing is of all-metal construction with duralumin spars, ribs and covering, a departure from the usual Fokker practice, and the fuselage is a welded tubular structure covered with detachable metal panels.

The D.23 has two engines, one mounted in the nose of the fuselage and driving a tractor airscrew, and the other in the stern and driving a pusher airscrew. The airscrews employed are of the three-bladed controllable-pitch type and they turn in opposite directions, an arrangement that it is claimed gives the aeroplane the same qualities as a glider. The engines fitted in the D.23 shown in Paris are the Walter "Sagitta" type, and give an estimated top speed of about 345 m.p.h. Larger and more powerful engines, such as the Rolls-Royce "Merlin," can be fitted, however, and the top speed would then be at least 400 m.p.h. A three-wheel undercarriage is fitted, and the makers claim that the D.23 is the first military aeroplane to be equipped with this form of landing gear. The pilot occupies a cabin mid-way along the fuselage, and as he is thus seated between the two engines they serve as a fairly good protection from enemy fire. In addition the front and rear of the seat he occupies is armour-plated just above the line of the engines.

This new Fokker fighter is armed with four fixed machine guns, two in the wing and two in the fuselage. The wing guns fire 1,000 rounds per min., and the fuselage guns fire 1,300 rounds per min.

American Air Line's 25,000 Flights

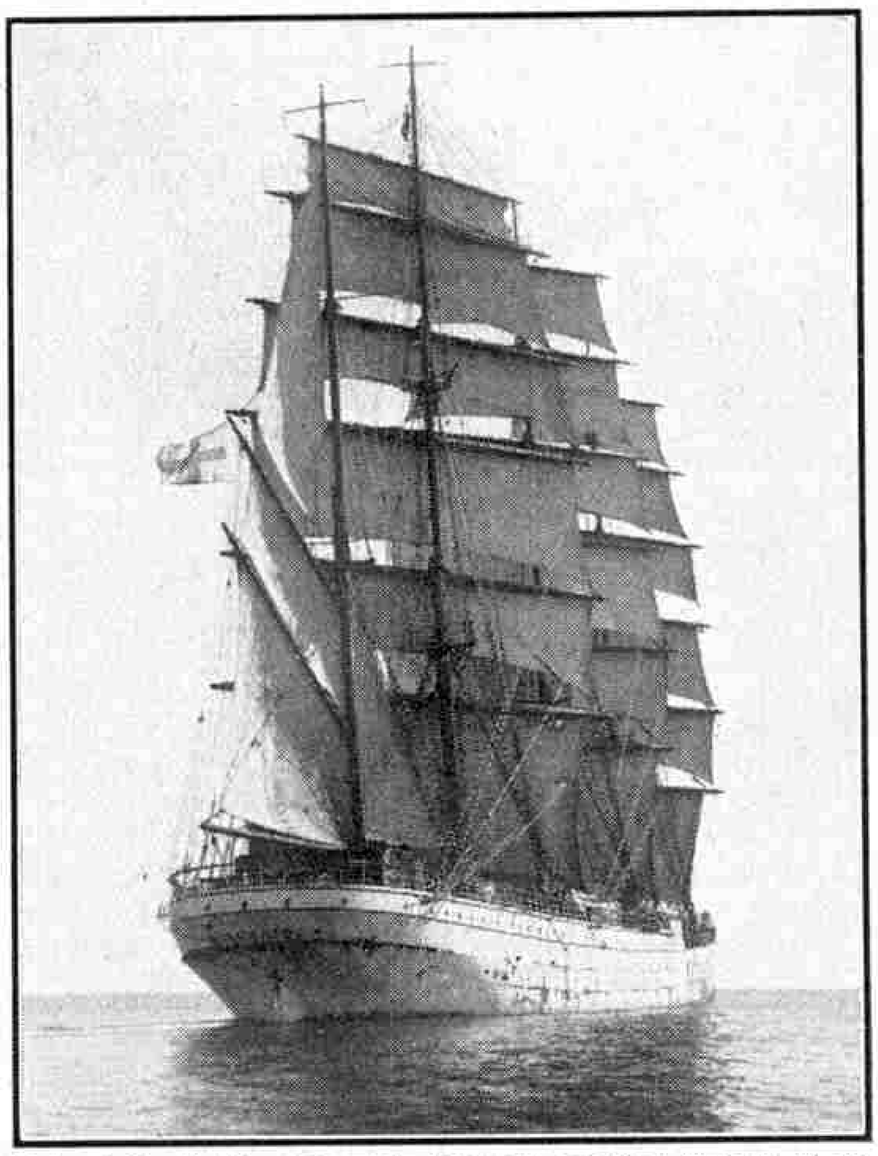
On the 12th January last a Douglas DC-3 of United Air Lines made the 25,000th scheduled flight by aircraft of that company over the New York–Chicago–California air route. The first flight was made in 1927 by a Boeing two-seater biplane, which made 14 stops along the route and completed the coast-to-coast trip in 33 hr., averaging 90 m.p.h. The Douglas DC-3 mentioned above did the trip with four stops in 16 hrs., at an average speed of 180 m.p.h.

The "*Herzogin Cecilie*" Passes

End of a Famous Finnish Barque

CAPTAIN GUSTAF ERIKSON, owner of nearly every square-rigged sea-going sailing ship afloat to-day, once said of his great fleet: "I love these ships, as all my life has been spent amongst them, and as long as I live I will do my best to keep them sailing with full holds." This sturdy Finnish seadog was born 65 years ago at Mariehamn in the Åland Isles, off the Finnish coast, and first went to sea at the age of nine as cook's boy. He gained his master's certificate when only 19, and in 1913 was able to fulfil a long-cherished ambition by purchasing his first vessel. He ran her so successfully and profitably that he was soon able to enlarge his fleet, and now is the owner of 11 fine steel sailing vessels in addition to several wooden schooners and motorships. This unique fleet has been handled with such skill through storm and calm, adventure and hardship, that since 1920 only four big ships have been lost.

Unfortunately one of the vessels to go was the "*Herzogin Cecilie*," the most celebrated of Captain Erikson's fleet. She fell victim to a Channel fog in April 1936, when, carrying a cargo of 4,295 tons of grain, she struck on the Hawstone Rock, off the Devon coast. Hopes were entertained for her recovery, and she was actually removed to Starehole Bay, Dorset, where it was intended to carry out temporary repairs to enable her to be towed into dock. Part of her cargo was removed, but a sudden gale damaged the ship further and Captain Sven Erikson, her master for the last eight years of her sea life, eventually was forced to give up work on her. As recorded in the February "*M.M.*," she recently capsized and completely disappeared, after a final resistance of nearly three years.



Under full sail. The "Herzogin Cecilie," one-time flagship of the sail fleet of Captain Gustaf Erikson, of Mariehamn.

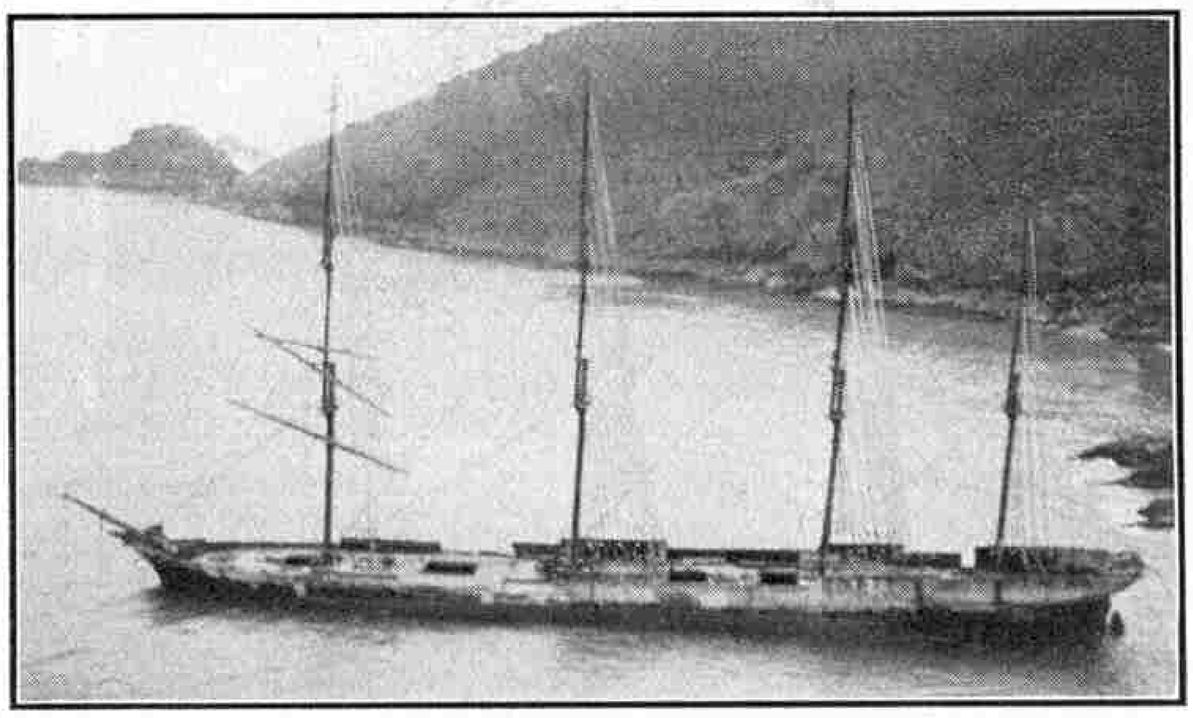
The history of the "*Herzogin Cecilie*" is a romantic one. She was ordered in 1901 by the Norddeutscher Lloyd Line from Rickmers Yard at Bremerhaven for the purpose of training cadets prior to their entrance into the company's service. No expense was spared, some £43,000 being spent in her construction, and was a truly magnificent ship when she was completed in 1902. Her builders gave her a steel hull of very great strength, and she was rigged as a four-masted barque, with a length of 334 ft. 8 in. and a gross tonnage of 3,242. Considerable cargo space was provided in addition to the extensive accommodation for cadets, of whom 60 were carried and her permanent crew of from 20 to 30.

The "*Herzogin Cecilie*" continued in this capacity until 1914, carrying a great variety of cargoes and achieving a reputation for fast sailing. Generally on the outward voyage from Germany her cargo consisted of manufactured goods, while homeward a bulk cargo usually was carried, perhaps nitrate from South America or grain from Australia. One of her fastest early passages was from Beachy Head to Adelaide in 78 days.

The declaration of war in 1914 caught the vessel in a neutral port in Chile, and there she remained until just before the Armistice. She was eventually handed over to the French, and was laid up pending disposal as they already had an excessive number of sailing ships. At this time Captain Erikson was building up his fleet, and in 1922 sent his senior master, Captain Ruben de Cloux, to Marseilles to inspect the "*Passat*," which was for sale at £11,000. On the way, Captain de Cloux happened to see the "*Herzogin Cecilie*" at Ostend, and finding her in perfect condition he bought her on the spot for £4,250. Captain Erikson was delighted. He was familiar with the previous career of the vessel, and decided to continue the training scheme with which she had so long been associated, with the object of giving sail experience to as many boys as possible.

So as a training ship the "*Herzogin Cecilie*" once more took the sea, under the command of Captain de Cloux, regarded by many as the finest sailing ship master under the Finnish flag, and along with several other of Erikson's big ships provided practically the only chance of sail training for Finnish, Swedish, Norwegian, Estonian and British youths and those of many other nations. Her first voyage under her new ownership was from Fredrikstad to Melbourne, for which she took 92 days, encountering en route a terrific gale that delayed her for a week. On her way home she brought nitrate from Chile, returning there for her second passage. The running of this great ship was so costly that expenses had to be cut to the absolute minimum, so she sailed with a total crew of 25 and on one occasion had only 19 aboard. From about 1925 she was chiefly occupied in the Australian grain trade, as were most of Erikson's sailing ships.

Much attention was attracted by the unofficial race homeward of the sailing ships of the grain fleet. The "*Herzogin Cecilie*" was the winner of this contest several times, her best passage being her last one, in 1936, when she reached Falmouth in 86 days from Port Lincoln, South Australia. On several occasions during her career she attained great speeds, and in 1931 she nearly equalled the highest speed ever recorded by a sailing ship, the 21 knots of the "*James Baines*" in 1856. On this occasion she was homeward bound after discharging her cargo in England, and covered 26 miles in 75 min. in a high wind, thus averaging 20¾ knots, a mere fraction below the record. Her best day's sailing was also accomplished about that time, when she covered 365 miles in 23½ hrs. while rounding the Cape of Good Hope, bound for Port Lincoln, and on the same trip there was a period of 2 hrs. when she maintained a speed of 17¾ knots. She was fresh from her grain race triumph of 1936 when she met her fate on the rocky coast of Devon, and thus another tall ship passed. How long the remaining fleet of picturesque veterans will last cannot safely be predicted, and their voyages are being followed with keen interest.



The "Herzogin Cecilie" in Starehole Bay, Dorset, where she was taken after striking the Hawstone Rock. She remained there nearly three years, sinking last January. Photograph by M. H. Howland, London.

New York's Marine Parkway Bridge

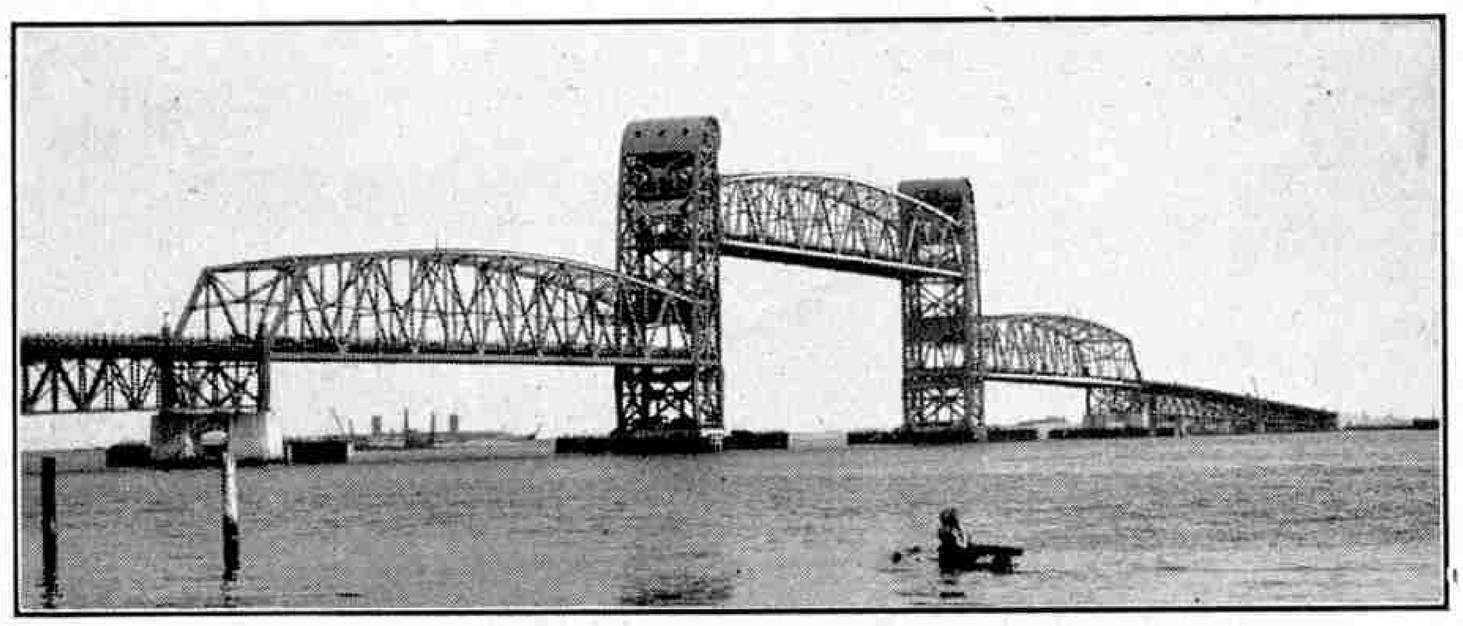
The Longest Roadway Lift Span in the World

NEW YORK has been well described as a city of wonderful bridges. As it spreads outward yet more bridges are being erected, and the most recent of these is the Marine Parkway Bridge, which opens up a new road to the shore of the Atlantic. This structure is about three quarters of a mile in length, and has a central span of 540 ft. that can be raised 95 ft. to allow sufficient headroom for vessels passing below. It is claimed that this is the longest lift span in the world carrying a roadway.

The new bridge crosses the channel known as Rockaway Inlet, which leads into Jamaica Bay, an almost land-locked stretch of water studded with islands. On the outer side of the inlet is a long sandy spit known as Rockaway Beach, the farther shore of which faces the open Atlantic, and there a great public recreation area known as the Jacob Riis Park has been developed from useless and unsightly marshland. The main portion of the beach has been increased in width by 700 ft. by pumping in sand from Rockaway Inlet. A bathing station, tennis courts and an 18-hole pitch-and-putt golf course have been constructed, and there is a parking ground 70 acres in extent that is capable of accommodating 14,000 cars. The car park is of concrete and is the largest paved area constructed for this purpose in the United States. The entire Park, with its greatly increased beach space, has room for more than 200,000 people. There is another Park at the shore end of the new bridge, and adjoining this is Floyd-Bennett Field, New York's famous airport.

An air view of the Marine Parkway Bridge, New York, with Rockaway Beach and the Atlantic Ocean in the distance. Illustrations by courtesy of the New York City Parkway Authority.

The Marine Parkway Bridge is built of steel, stretching between concrete abutments at its ends and resting on 14 concrete piers. The three central spans are the longest. One of these is the lift span already described, which is flanked by two fixed spans, also 540 ft. in length, that give a clearance of 50 ft. above mean high water. On each side of the central section there are six smaller spans. Altogether the bridge has in it 12,000 tons of steel, and provides a roadway 44 ft. in width, with a 6-ft. sidewalk. The whole structure is painted a greyish green, and the towers and other important parts are lined out in aluminium paint that makes them show up well in contrast.



The three central spans of the bridge, each with a length of 540 ft. The central span weighs 2,180 tons and electric motors raise it 95 ft. in two minutes.

The central span stands out as the most prominent feature of the bridge. Its great towers reach a height of 225 ft., and are handsome in appearance, their tops being rounded off in a spiral curve that gives them a light and graceful appearance. The upper part of the spiral is covered with plating concealing the machinery that raises the lift span, which weighs 1,280 tons and is hoisted by means of 80 wire ropes passing over eight sheaves, four at the top of each tower. In its movement the span is guided by rollers that engage with flanges on the columns of the towers, and inside the towers are steel boxes containing concrete that act as counterweights and are guided in a similar manner as they rise and fall. Electric motors raise the span to its full height in two minutes and there are air buffers to prevent shock, both when the span reaches its seating when it is being lowered and when it attains its greatest height on being lifted.

A particularly interesting feature of the Marine Parkway Bridge is that the roadway and footway on the three central spans do not consist of concrete slabs, as do those of the rest of the bridge, but of open steel grating. The purpose of this method of construction is to reduce the dead weight, especially in the movable central span, which requires considerably less power to lift it than it would have needed if its roadway had been made of concrete. For normal operations four 200-h.p. motors are used, two on each tower, and these are so arranged that only one of each pair is used to move the span, the remaining motors regulating the movements, keeping the two driving motors in step in order to make sure that the span remains level when it is in motion. Four independent 50-h.p. motors are installed for use in emergency, and these alone can raise the span to its full height in seven minutes.

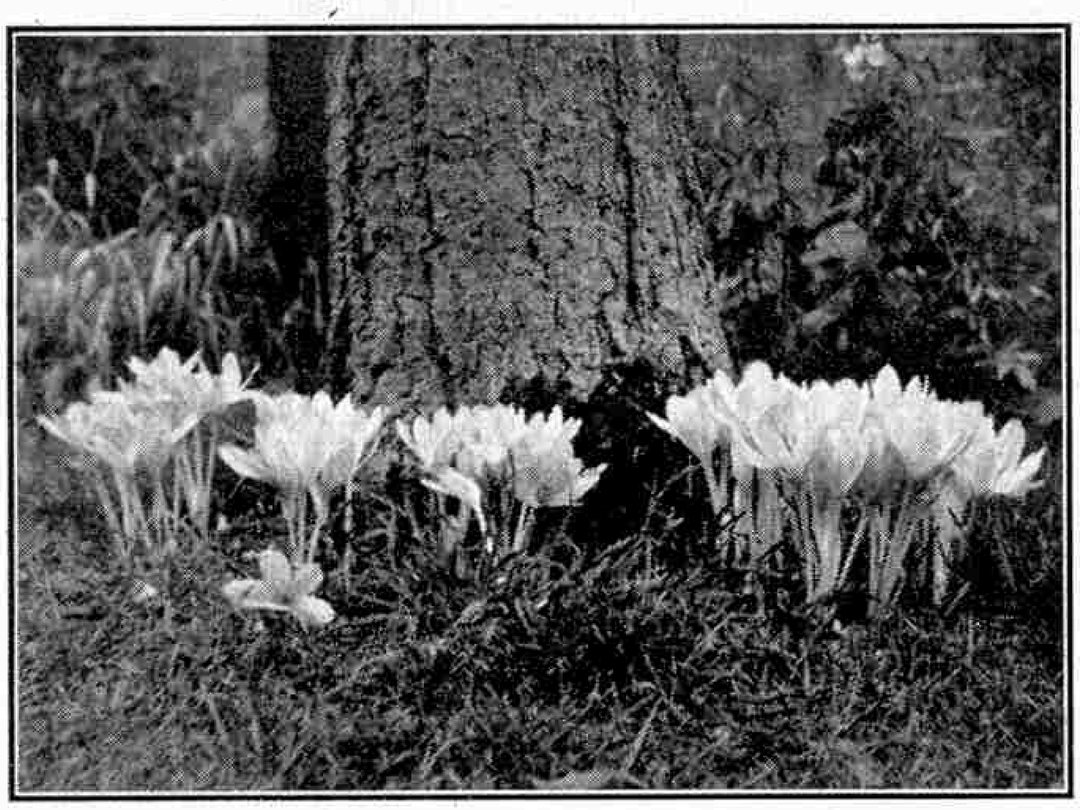
The building of the piers was of great interest, for the channel that had to be crossed ranges in depth from 35 ft. to 42 ft. and there is an average tide of about 5 ft. A strong tidal current sweeps through the Inlet and heavy seas prevail on the exposed site of the bridge when there are high winds from certain quarters. Yet the work was done so rapidly that the entire bridge was completed in a few days over a year.

The first thing that a bridge engineer looks for is a firm foundation for the piers that are to carry the weight of his structure. He prefers rock, but the bottom of the Rockaway Inlet was found to be of fine sand and borings to great depths showed nothing but medium and coarse sand, for there bed rock is several hundred feet below the surface. It was therefore necessary to use timber piles to support the bridge, and the Marine Parkway Bridge stands on more than 2,000 of these, each about 50 ft. in length.

The piers were built inside cofferdams formed by driving into the sand rings of steel sheet piles interlocking with each other. When the bridge was finished it was necessary to cut off the tops of the steel sheet piles. This meant dealing with about 2,100 piles and the work had to be done by a diver making use of a special oxygen-hydrogen torch that would burn under water. The diver worked inside the cofferdams at an average depth of 32 ft. and at first only succeeded in cutting 31 piles a day. Later he was able to cut through 30 piles an hour, although the work was done in the depth of winter, and he completed his task in 40 days.

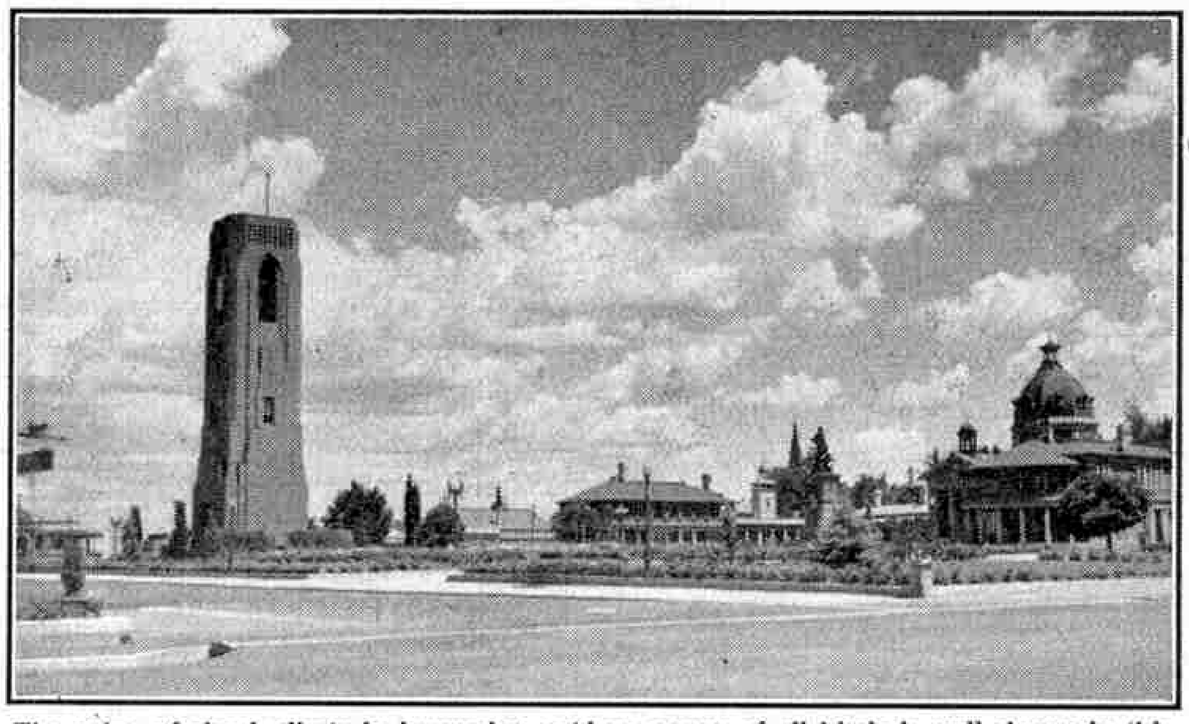
PREPARING FOR SPRINGTIME "SHOTS"

THOUSANDS of keen amateur photographers like myself who have been busy with indoor activities, such as table-top and home portraiture, during the winter months, are reminded by the gradually lengthening days that it is now time to turn their attention to outdoor work, which after all is the branch of photography in which most of us are mainly interested. Unfortunately, however, there are many amateurs who stow away their photographic paraphernalia at the end of summer, and then forget all about the hobby until urged by the spring sunshine to root out their cameras from their hiding places.



"Crocuses." A fine woodland picture by Miss J. Wedgwood, Chinnor, Oxford.

Modern photographic apparatus is very reliable and sturdily constructed, but I am afraid that many cameras that have hibernated throughout the winter, possibly in damp and dusty places, will not be improved in condition by their long rest. It is well therefore to examine the camera carefully to make sure that everything is in working order before putting in a plate or film. First remove any dust that has accumulated either inside or outside the camera. It is surprising how much dust does get into a camera that has been laid up for a time, and unless this is carefully removed it will be a constant source of spotted negatives. I always clean out the interior of my camera with a camel's hair brush smeared very lightly with glycerine, and I find this picks up even the smallest particles of dust quite easily. Care must be taken, however, not to use more than a mere trace of glycerine and not to touch the lens with the brush.



The value of cloud effects in improving outdoor scenes of all kinds is well shown in this photograph by G. C. Taylor, Willoughby, New South Wales.

The next thing is to ensure that the bellows are light-tight. The easiest method is to examine the camera in a dark room by holding a flash lamp inside it, when any pin-holes will be revealed immediately. If any small holes are found they can be usually repaired with a small piece of adhesive plaster applied on the inside, but if the holes are large and in awkward places, it is best to have them attended to at a camera service depot.

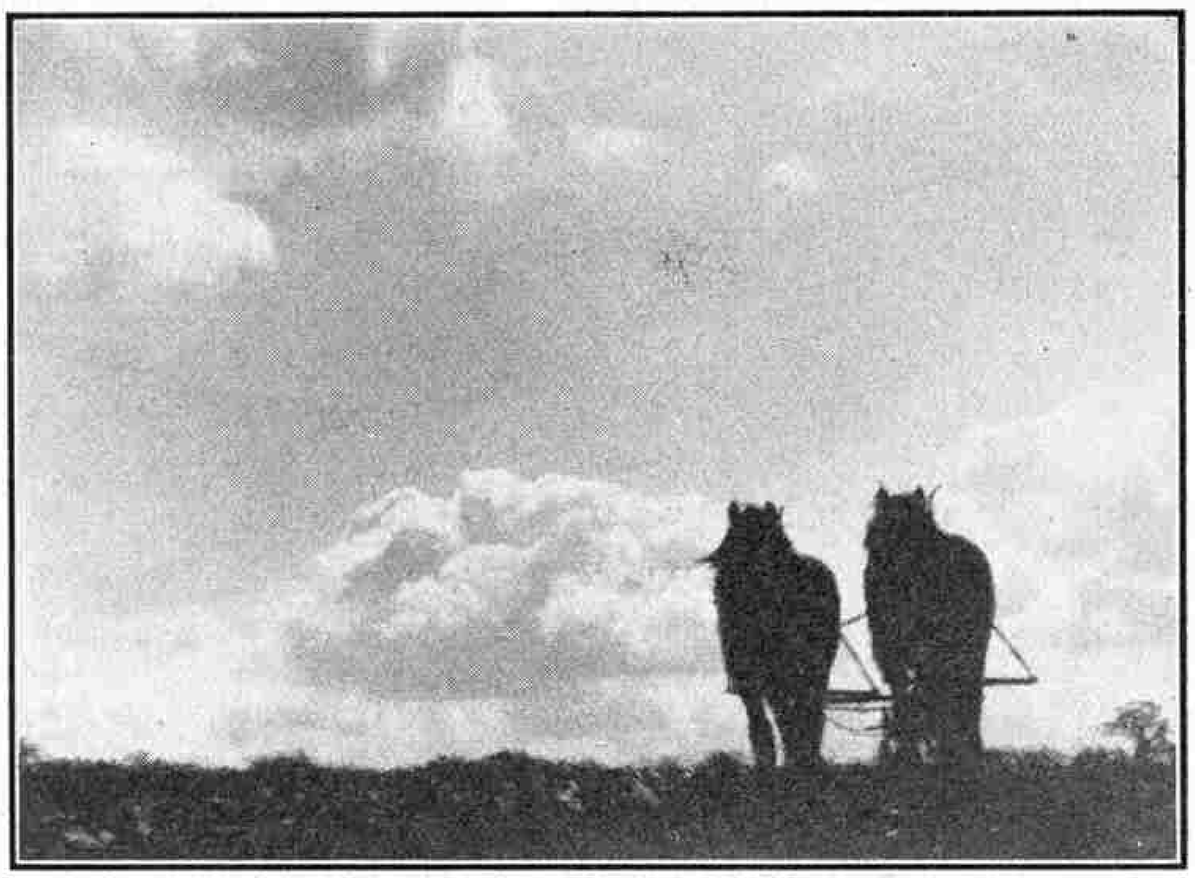
There are other causes of light leaks apart from the bellows, however, and in the cheaper cameras particularly a common source of trouble in this direction is the shutter. The best way to test for leaks of this kind is to expose a plate or film and then develop it. If stray light is entering the camera when the shutter is closed the usual effect is a circular patch of fog in the centre of the negative. If the shutter is found to be faulty do not attempt to put the matter right yourself. Even the comparatively simple shutters fitted to cheap cameras are too intricate and delicate for an amateur to repair, and the wisest plan is to have the job done by a camera expert.

Most box-type cameras when past their youth are apt to let in light at the joints of the back. An instrument that suffers from this unfortunate complaint produces strips of fog across and down the edges of the negative. Minute holes in the corners of the camera usually result in fan-like radiations of fog appearing over the whole or part of the negative. If the camera ails in any of these directions

there is no need to throw it in the river or even to be unduly despondent, for as a rule faults of this type can be put right for a shilling or two by any camera mechanic.

It is a good plan to rub a bit of beeswax or candle-grease on the guide rollers over which the film passes so as to remove any slight roughness caused by a damp atmosphere; and also to apply the smallest trace of oil to their bearings. In doing this, however, it should be kept in mind that no oil or grease must come in contact with the film itself, so the job should not be tackled in the manner of an engine driver oiling the *"Coronation!"*

A perfectly clean lens is essential to good results, and the best way to keep it in this condition is to brush it very gently with a camel's hair brush and then polish it with an old silk handkerchief. If the lens is one of the more expensive types composed of several glasses do not attempt to unscrew and separate the glasses in order to clean them. It is only necessary to clean the outer surfaces of the lens. There is little likelihood of the inner surfaces being dirty. After giving the view finders a look over and cleaning and polishing them, the camera should be ready for a good season's work. There should be no difficulty in finding subjects on which to make a start. In springtime naturally it is the countryside that provides the most seasonable subjects, and many pictures can now be made that are not possible at any other time of the year. For example, snowdrops, crocuses and daffodils are now beginning to make their appearance in gardens and woods, and every keen photographer should endeavour to obtain at least one good picture of these welcome flowers in their natural surroundings. A good plan is to isolate a group of flowers by placing behind them a sheet of dark brown paper, which can be erected against a simple supporting framework of sticks.

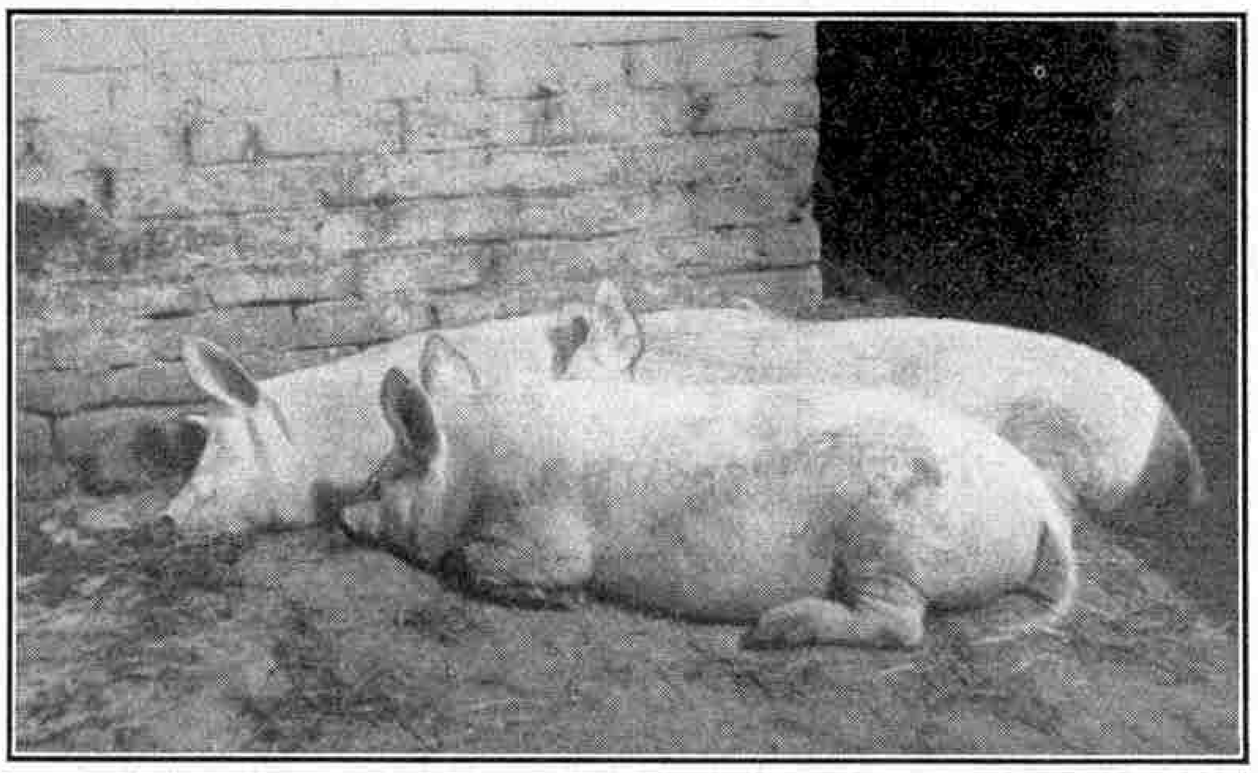


"Ploughing." A fine springtime picture of life on the farm, by J. R. Tottle, Taunton. It was taken with a reflex camera on an Ilford S.G. Pan. Plate, exposure 1/75 sec. at F/16.

Most box cameras will not focus sharply objects at distances less than about 8 ft., but they can be adapted for close-up work by fitting over the permanent lens a supplementary lens known as a portrait attachment. With the aid of a portrait attachment the camera will focus sharply objects placed as close as 3 ft. from the lens, and will give a large image. Such attachments suitable for use with almost any make of camera can be obtained from any photographic dealer. They do not affect the operation of the camera in any way; their object is simply to reduce the focal length of the regular lens to permit of working closer to the subject.

Here is another suggestion that I think will interest all photographers who live near farms or who make occasional walking or cycling trips in the country. Why not make a collection of pictures illustrating farm life and activities? I once saw a complete collection of this kind that had been taken with a $2\frac{1}{4}$ in. by $3\frac{1}{4}$ in. film camera at different times of the year, and I found it most interesting. Most farmers, if approached in a proper manner, will give permission to take photographs on their premises, and once this permission is obtained there will be no difficulty in finding good subjects.

Now is the right time to start making a collection of this kind!



Pictures such as this are to be obtained on almost all farms. Photograph by F. Miller, Oldham.

Prizes for Springtime Photographs

This month we offer prizes for the most interesting outdoor photographs illustrating early spring in the country. Woodland and farm scenes, spring flowers, March skies, and similar subjects typical of this time of the year are suitable for entry.

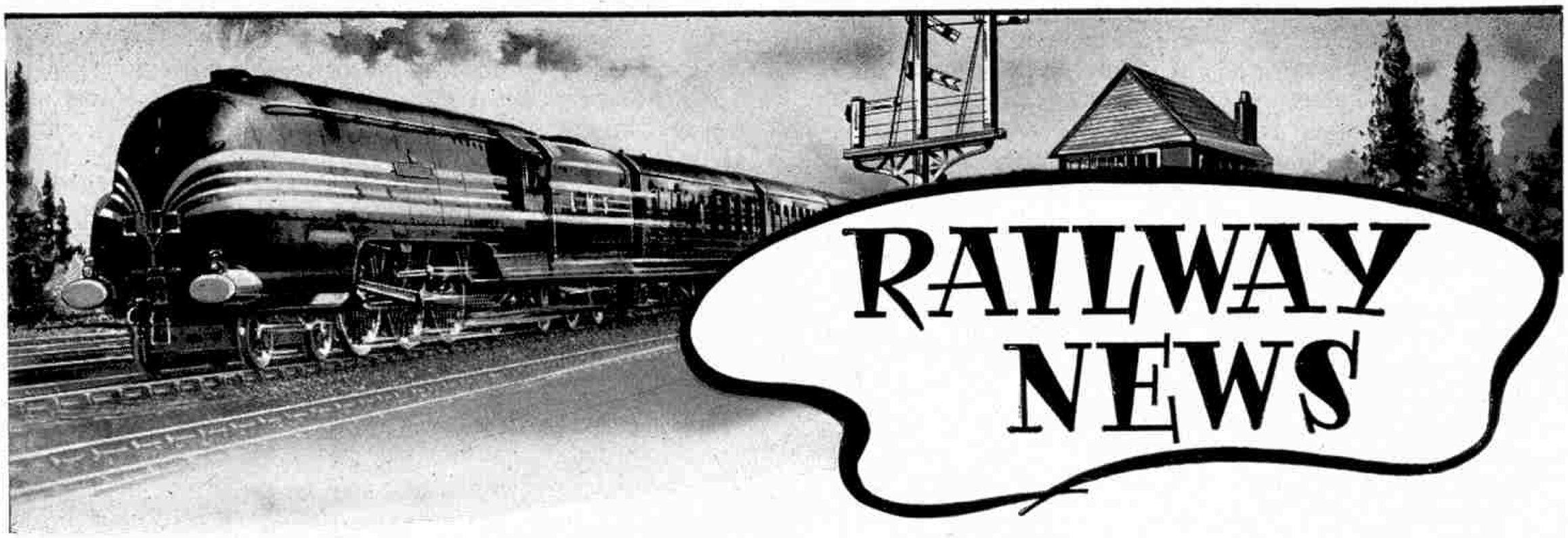
Photographs may be taken with any type of camera, and any kind of plate, film or printing paper may be used. There is no restriction as to age, and competitors living in any part of the world are eligible. Photographs must be taken by competitors themselves, but developing and printing may be done professionally if desired.

Competitors in Overseas countries where the season is different from that in the British Isles, should regard the competition as being for outdoor countryside photographs typical of the season now reigning in their own land.

Prizes of photographic materials or Meccano and Hornby products to the value of 21/–, 15/– and 10/6 respectively will be awarded for the three most interesting photographs sent by readers in the British Isles, and a similar set of prizes will be awarded for the three best pictures sent by Overseas readers.

The Home Section will close on 31st March, but entries from Overseas readers will be accepted up to 31st May.

Each print must be titled and must be accompanied by details of the camera, exposure and materials used. Entries should be addressed *"Countryside Photographic Competition,"* "Meccano Magazine," Binns Road, Liverpool 13.



RAILWAY NEWS

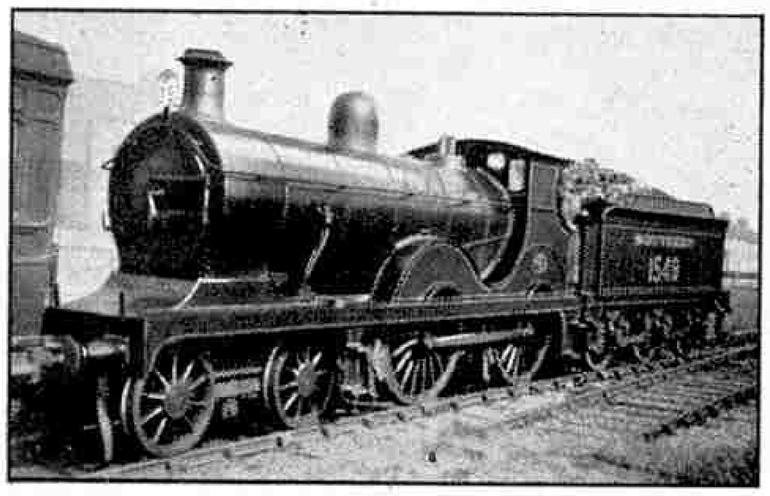
Smart Work on Liverpool-York Run

A good locomotive performance is recorded by Mr. O. S. Nock who travelled recently by the 10.40 a.m. express from Liverpool (Exchange) to York. The 295-ton load was worked through by class 5P5F 4–6–0 No. 5204, of Wakefield shed. In fairly clear weather a brilliant start was made from Liverpool, and 72 m.p.h. was reached in less than 7 miles out. The 7.2-mile climb to Upholland was covered in only 6¾ min., and for the last 2½ miles, where the gradient is 1 in 118-111, speed did not fall below 50½ m.p.h. So the 14.2 miles to Upholland were covered in 15¾ min.

Fog developed at Hindley, and hereabouts there came the severe colliery pitfall slack, to 25 m.p.h., but even under such conditions the driver was able to recover to pass Pendleton 2½ min. early. Manchester was reached inside schedule in 44¼ min.

The 2.8 miles to Newton Heath occupied 15 min. instead of the scheduled 7 min., and further checks made the train 15 min. late at Rochdale. The engine crew now put in some excellent work, and the 18.2 miles from Rochdale, inclusive of fog delays west of Summit tunnel, were completed to time, in 25 min.

At Mirfield the express had to be looped round a freight train, and at Normanton, where the Midland Division tracks are used for a short distance, a stop occurred to allow a Leeds to St. Pancras express cross in front. Throughout No. 5204 continued to show her paces, however, particularly in a brilliant start out of Brighouse, where 60 m.p.h. was attained in 3 miles. Then came a glorious sprint to York. Sherburn-in-Elmet was passed at 72 m.p.h., a slight signal check to 35 m.p.h. was experienced to Church Fenton, after which No. 5204 forged ahead again to a final burst of 68 m.p.h. at Copmanthorpe. At York No. 5204 was relieved by an L.N.E.R. 4–6–2 No. 2599 *"Book Law"* for the run on to Newcastle.



Former S.E.C.R. 4-4-0, now S.R. No. 1549, at New Romney. Photograph by T. G. Cook, Croydon.

L.N.E.R. Track Equipment Orders

Orders have been placed by the L.N.E.R. for 14,300 loads of crossing timbers, 400,000 sleepers, 2,110,000 gallons of creosote oil for "pickling" crossing timbers and sleepers, and 500 tons of linseed oil. This equipment is to be used in renewing 569 miles of track during this year.

Five more portable petrol-electric drilling and screwing machines are to be installed in the Southern Area of the L.N.E.R., making a total of 29 in use on the system. These machines will be used for boring holes in sleepers and inserting chair screws, and they will allow re-sleepering operations and the relaying of track to be speeded up.

G.W.R. Notes from Swindon

The G.W.R. are reconstructing 41 of the "3150" class 2–6–2 tank engines with 5 ft. 3 in. diameter driving wheels, and boilers pressed at 225 lb. per sq. in., an increase of 25 lb. per sq. in. They are being renumbered 3100 to 3140. Also being rebuilt at Swindon are 50 engines of the "5100" class, which will be renumbered 8100 to 8149. These engines will have 5 ft. 6 in. diameter driving wheels and a boiler pressure of 225 lb. per sq. in. The new engines, several of which are now in service, will be used on both passenger and goods services.

Other new engines turned out from Swindon include 4–6–0s Nos. 5091 *"Cleeve Abbey,"* 7810 *"Draycott Manor"* and 7811 *"Dunley Manor."*

L.N.E.R. News

Class "V2" 2–6–2 tender engines Nos. 4812, 4813 and 4814 are in traffic. "K4" 2–6–0s Nos. 3442 *"The Great Marquess,"* 3443 *"Cameron of Lochiel,"* 3444 *"Lord of the Isles,"* 3445 *"Mac Cailin Mor"* and 3446 *"Lord of Dunvegan"* also are in service.

Vacuum brake gear is to be fitted to 176 additional banana vans to permit them to run in express freight trains with average speeds of over 40 m.p.h. The present total stock of banana vans on the L.N.E.R. is 700, and 50 more are to be constructed this year.

Experiments carried out with a mechanical wagon unloader have proved successful, and the L.N.E.R. are to instal one in the Sheffield district as part of the permanent way equipment. The unloader consists of a mechanical excavator fitted with a patent push plate that is used for unloading wagons of refuse.

L.N.E.R. 4-6-4 "No. 10000," hauling the 4 p.m. down Newcastle express near South Muskham. On the left, at the side of the track, is a water trough sign. Photograph by J. P. Wilson, Nottingham.

L.M.S. Locomotive News

From the L.M.S. journal *"On Time"* we learn that 20 streamlined 4–6–2s are to be built this year in addition to 35 class 5P5F 4–6–0s, 15 class 8F 2–8–0 tender engines and 20 class 4P 2–6–4T engines. No. 5515 of the "Patriot" class is to be named *"Caernarvon."*

Former L.N.W.R. "Prince of Wales" 4–6–0s Nos. 25756 and 25802 and "George the Fifth" 4–4–0 No. 25322 *"F. S. P. Wolferston"* have been condemned.

Spirited L.M.S. Locomotive Work

A striking instance of time recovery was reported by Mr. D. S. Barrie during recent foggy weather, when the 10.40 a.m. express from Euston to Carlisle and North Wales left Rugby 10 minutes late owing to fog in the London area. The load was 328 tons tare and the engine was No. 5316, one of the class 5P5F 4–6–0s, in charge of Driver D. T. Williams and Fireman A. J. Hatton of Bangor.

After regaining one minute from Rugby to Nuneaton, No. 5316 made a splendid run across the Trent Valley and accomplished the next stage to Stafford, 36.5 miles in 35 min. 40 secs. start-to-stop, thus averaging practically 62 m.p.h. and regaining a further 5 min. of lost time. Maximum speed on this section was 76 m.p.h., the 23 miles between Polesworth and Milford being run at an average of 70.5 m.p.h. More good work followed between Stafford and Crewe, speed riding steadily to the mile-a-minute rate at the top of the 14 miles ascent to Whitmore, whilst on the descent into Crewe a top speed of 82 m.p.h. was attained. The 24.5 miles between Stafford and Crewe were covered in the excellent time of 27¼ min., thus completing a gain of 8 min. to the engine in little over 75 miles.

Turbo-Electric Engine for American Railroad

General Electric and Union Pacific Railroad engineers have designed and built a new type of electric locomotive carrying its own steam-turbine power plant, which will be used to generate electric power in exactly the same manner as is done in any power station. The locomotive is the first of its kind in the world and consists of two units each 90 ft. long; the weight of each unit is about 265 tons. It is claimed that this engine will be capable of hauling a train of 15 standard Pullman cars from Chicago to the Pacific Coast at speeds up to 125 m.p.h.

It is claimed that the new turbo-electric engine will do twice the work of the conventional steam locomotive for each pound of fuel consumed, and will cover three times the distance without stops for either fuel or water. In warm weather, when the steam car heating plant is not in use, it will be able to travel over its full run without a single stop for water.

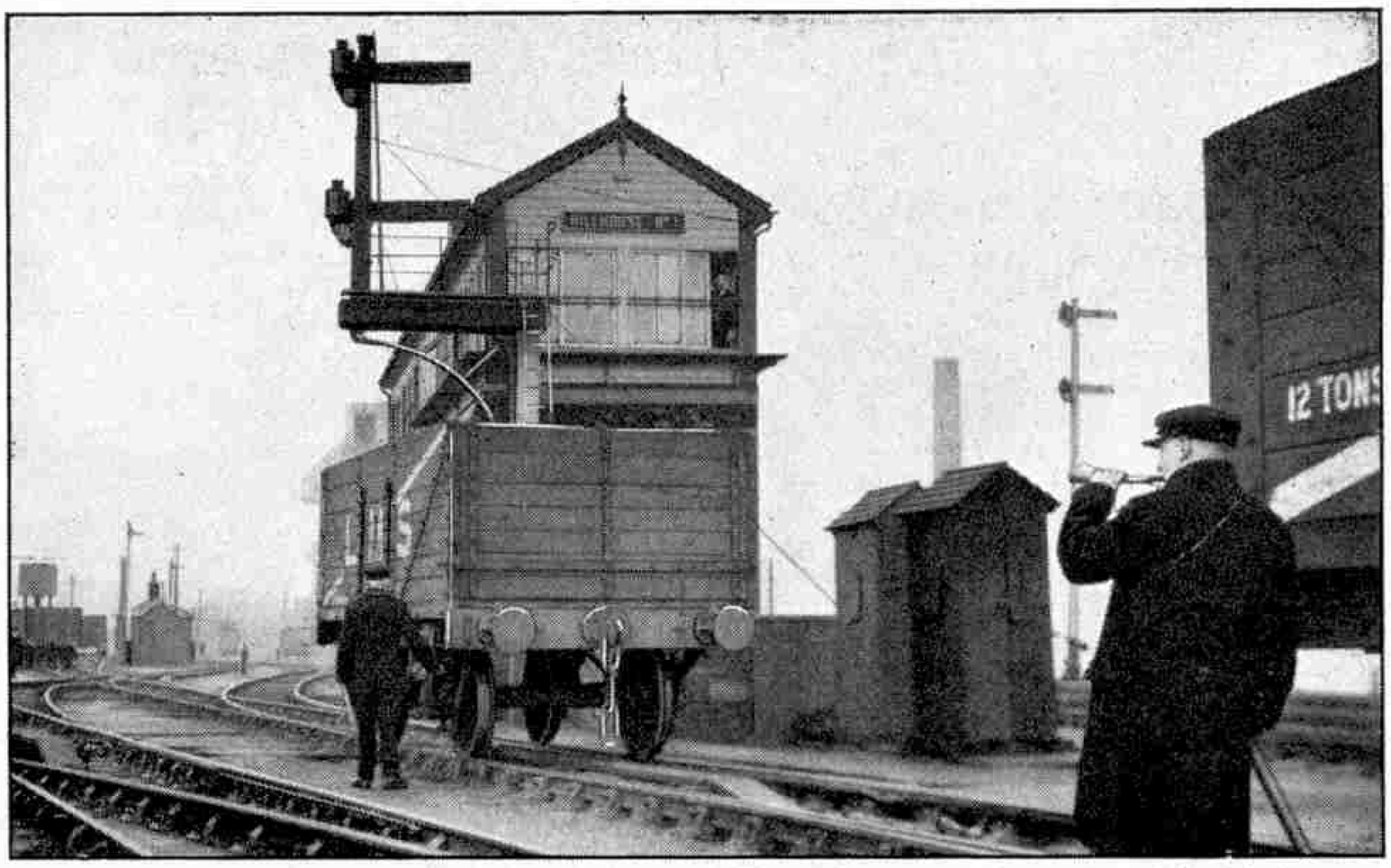
Yorkshire Push-and-Pull Trains

Push-and-Pull trains will shortly be put into service on the L.N.E.R. Harrogate to Pateley Bridge, Harrogate to Pilmoor, and Harrogate to Bradford services.

These trains, one of which has been in use on the West Hartlepool and Ferryhill branch for about 12 months, have several advantages. The necessity for an engine to run round its train is obviated and shunting movements are reduced. On sections of the line where traffic is too light to justify a steam train, but is beyond the capacity of a steam or Diesel coach, this type of train is of the greatest service.

New Turntables for L.M.S.

New vacuum-operated turntables are to be installed by the L.M.S. at Plodder Lane (Bolton), Widnes, Keswick, Wellingborough, Sheffield (Grimesthorpe), Peterborough, Toton (Derbyshire), Evesham, Leicester, and Liverpool (Exchange). Eight of these will be of a greater diameter than those which they replace, in order to accommodate the larger locomotives now being used in those districts.



Shunting in progress at Hillhouse Marshalling Yard, Huddersfield. Photograph by courtesy of the L.M.S.

Presentation to "Coronation"

We learn from *"The Railway Gazette"* that, as a gesture of goodwill from American model railway enthusiasts, *"The Model Railroader,"* an American model railway magazine, has arranged for the presentation of an appropriately-engraved standard American locomotive whistle to *"Coronation"* during its visit to the United States. The presentation will probably take place in the Grand Central Station, Chicago, scheduled to be visited on 2nd April. The cost of the whistle and engraving will be defrayed by contributions from readers of *"The Model Railroader."*

Vast Signalling Scheme for Wigan

The complete re-equipment of the signalling arrangements in the Wigan area has been decided upon by the L.M.S. It provides for the replacement of the existing ordinary semaphore signals by colour-light signals, and the electrical operation of many of the points.

Under the new scheme the whole of the working will be concentrated in three new signal boxes, which will do the work of 12 existing boxes. Approximately 700 trains daily will be affected by this important scheme. Much shunting work that is performed at both stations, Wallgate and North Western, will be expedited when the new signalling is in operation.

"The Locomotive Stock Book"

"The Locomotive Stock Book," published by the Railway Correspondence and Travel Society, has become the standard reference work amongst locomotive enthusiasts. It is being published again this year in an enlarged form, and will give lists of the locomotive stocks on all English and Irish lines as at the 31st December last. An annual review of British locomotives and statistical analysis will be incorporated and, as hitherto, all classes which became extinct during 1938 will be illustrated.

Although the book is enlarged its price remains unaltered at 2/6 post free. Copies should be available next month, and orders with remittances can now be accepted by the Society's Hon. Publication Manager, Mr. R. T. Pollock, 102, Disraeli Road, Putney, London S.W.15.

One of the fleet of Rock Island "Rockets," consisting of one power car and four trailing cars. These trains are beautifully appointed with the latest travel comforts. Photograph by courtesy of Rock Island Lines.

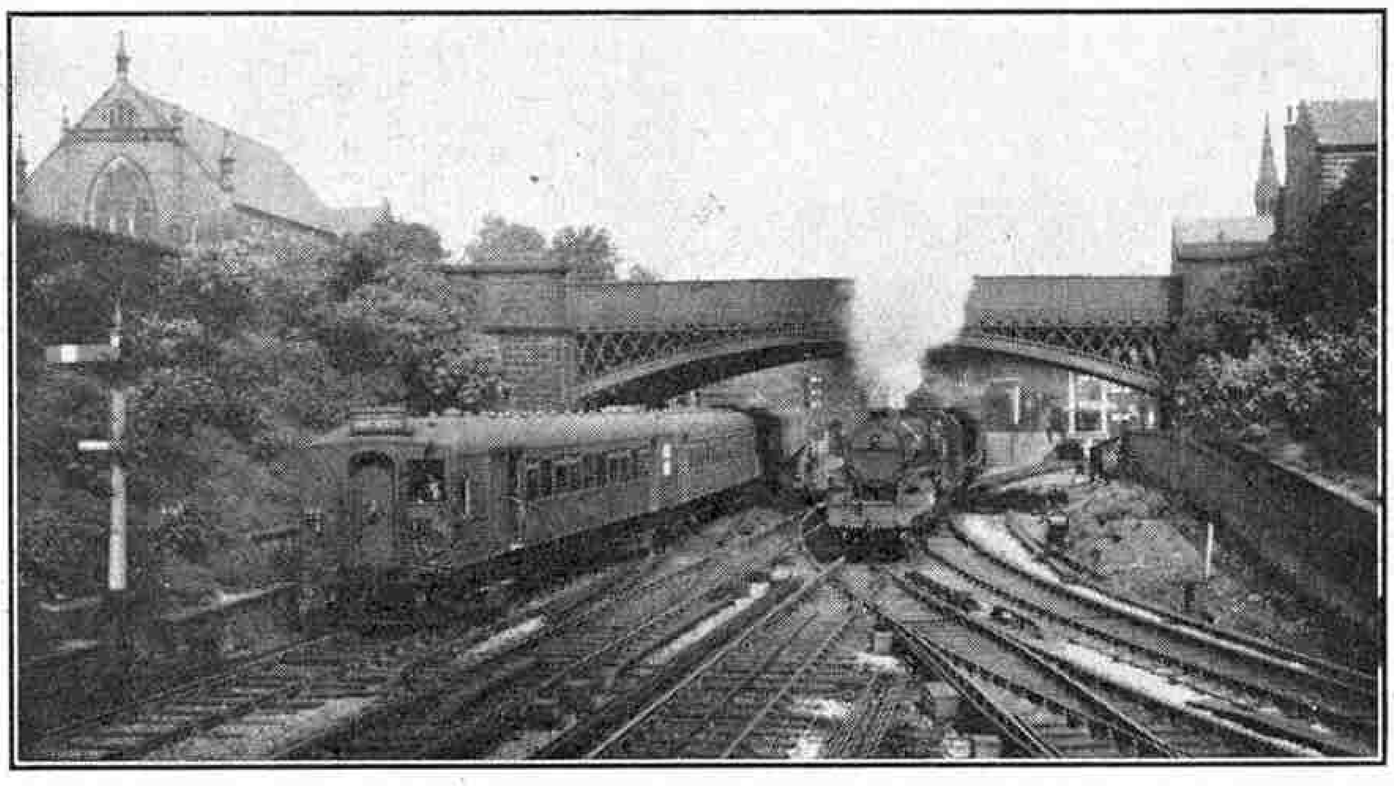
Railways of "England's Backbone"

The L.M.S. Central Division and its Immense Traffic

By D. S. Barrie

PROMINENT among the many railway centenaries that will be celebrated this year is that of the opening of the first section of the Manchester and Leeds Railway, the virtual forerunner of what is to-day the densest large area of railway traffic in the country, the Central Division of the L.M.S.

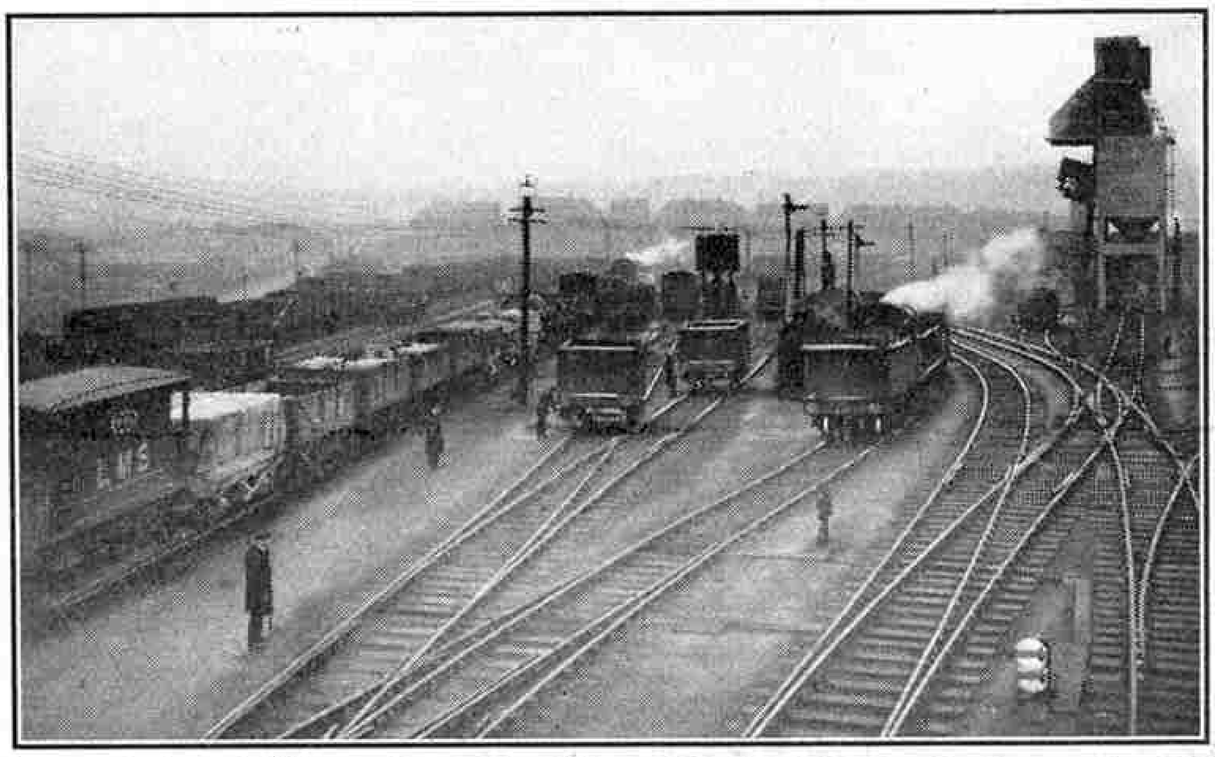
Like unto a colossal railway jig-saw superimposed upon the "Backbone of England"—the Pennine Range—is the extraordinary network of lines now comprising this Division of the L.M.S. It has two separate and distinct main lines running right across England, and innumerable series of branches—many of them of main-line importance themselves—feeders, junctions and connecting curves. Equally contrasted, too, is the background of the railway, ranging from that jolly "Playground of the North," the Lancashire Coast, to the teeming twin cities of Manchester and Salford, the sturdy "woollen belt" cities and towns of Yorkshire, the little industrial villages of the Pennines huddled into sheltering folds of the forbidding hills, the Lancashire cotton towns with their forests of tall chimneys, and the wild, high moor-topped ridges that divide one industrial valley from another. A sturdy country, this, that has produced some great men, and great railways.



Electric and steam trains leaving Bury, a busy centre on the L.M.S. Central Division. The photographs to this article are reproduced by courtesy of the L.M.S.

The L.M.S. Central Division serves almost the whole of industrial Lancashire and a large part of industrial Yorkshire, and may claim to tap a closer concentration of population than any other local railway system of comparable size. The population served exceeds 8,400,000, with an average of over 1,800 to the square mile, compared with less than 600 per square mile for the rest of England and Wales; while there are situated on the Central Division no fewer than 25 towns having populations of over 50,000.

The Central Division comprises the whole of the former Lancashire and Yorkshire Railway—which was amalgamated with the London and North Western Railway in 1922, becoming part of the L.M.S. in 1923—together with that portion beyond Manchester of the old L. and N.W. main line from Liverpool (Lime Street) to Leeds (City). The total mileage of the Division is about 660 route miles, and within these limits there are nearly 350 passenger stations, about 730 signal-boxes, nearly 250 junctions and 101 tunnels.



A general view of Hillhouse Marshalling Sidings at Huddersfield. The structure on the right is a ferro-concrete locomotive coaling plant including a wagon hoist.

The three longest tunnels on the Central Division are Summit Tunnel, between Littleborough and Walsden on the old Manchester and Leeds Railway, of which it marks the summit; Morley Tunnel on the former L. and N.W. route between Manchester and Leeds; and Standedge Tunnel through the Pennines between Marsden and Diggle. All these tunnels have been undergoing extensive repairs in recent years, owing to the ravages which time has wrought with their linings.

Summit Tunnel, engineered by George Stephenson, pierces the Pennines for a distance of 2,885 yds. at a depth of 300 ft. below the surface; it cost £251,000 to build and gave employment to 1,000 men for nearly 2½ years, the total quantities of material used including 23 million bricks and 8,000 tons of cement. The repairs which have been in progress to the lining of the tunnel for the past eight years have been rendered more difficult by reason of the intensive traffic, between 200 and 300 trains passing through the tunnel daily. To protect the workmen, special warning gongs operated by the engines of approaching trains, are placed in the tunnel.

In connection with the working of trains through Summit Tunnel, additional signal-boxes known as Summit West and Summit East are provided at each end of the tunnel. That at the east end, near Walsden, was the first signal-box on the L. and Y. Railway to be equipped (1874) on the electric block telegraph system.

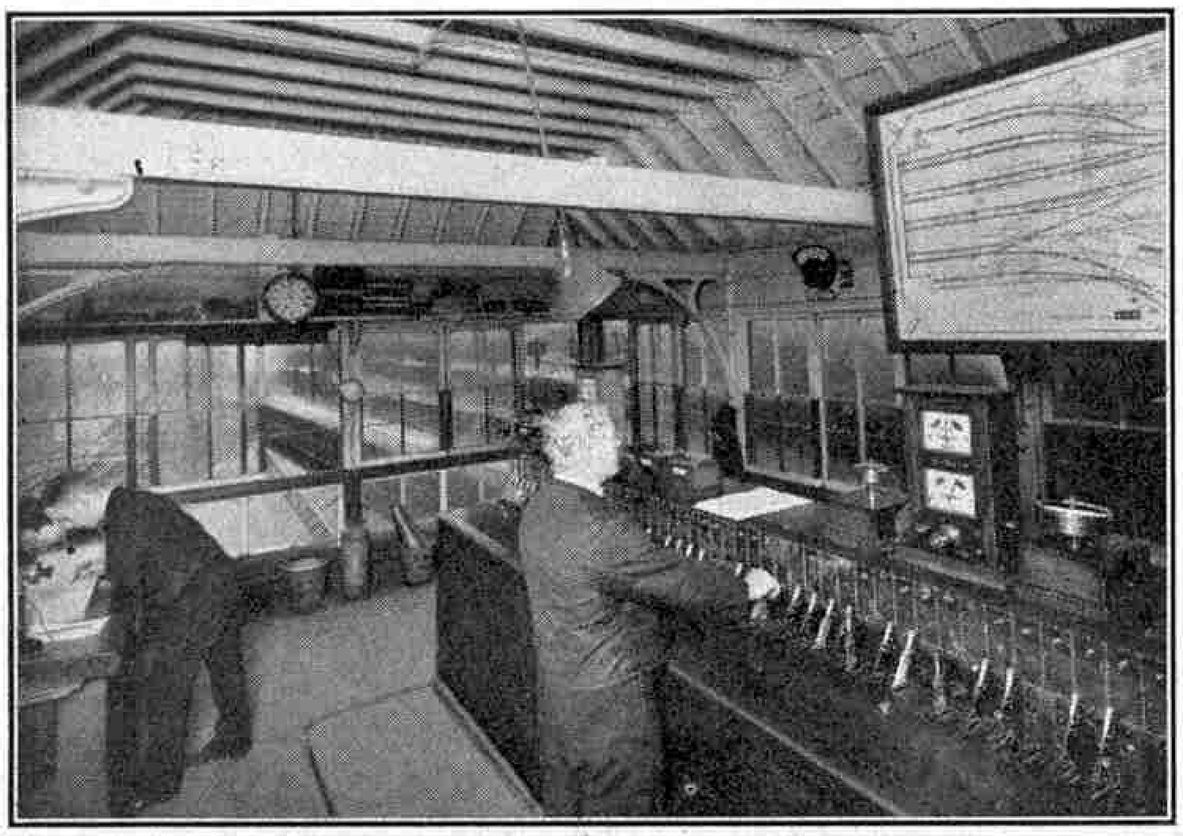
The three parallel Standedge Tunnels, two single-track and one double-track, at the summit (Diggle) of the line between Manchester and Huddersfield, are each 5,340 yds. long, and afford a curious feature of working in that there is alongside yet a fourth tunnel, 3 miles 135 yds. long, which accommodates a canal. There is no towpath, so the boats are worked through the tunnel by the bargehands thrusting against the roof or sides with poles, or even with their hands and feet. The canal tunnel is too narrow for barges to pass one another, but the canal keepers at each end maintain touch with the L.M.S. signalmen, who thus help to control the canal tunnel on the telephone-block system! A further curious feature of the Standedge railway tunnels is that water troughs are situated inside them, near the Manchester end, the tunnels being level throughout.

There are also in various parts of the Central Division a number of imposing viaducts spanning the valleys, notably on the Huddersfield and Penistone branch, which is traversed by the L.M.S.–L.N.E.R. through trains between Bradford (Exchange) and London (Marylebone).

Since the majority of the Central Division lines are located across the Pennine Range or among its foothills, it is not surprising to find that gradients are nearly all heavy and continuous, including some of the steepest in the country, a disability rendered still more onerous by sharp curves. On the Middleton Junction–Oldham branch there is a ¾-mile incline rising towards Oldham at 1 in 27, worked by

locomotive power, this being the steepest on the L.M.S. up which regular passenger traffic is worked. On the Manchester–Accrington–Colne main line the severe gradients include the famous Baxenden Bank, which rises continuously for 12 miles from Radcliffe North Junction, Bury, with a final five miles steeper than 1 in 80. Another section with exceptionally severe gradients is that from Bolton to Hellifield, where there is a section of 6½ miles at 1 in 72½.

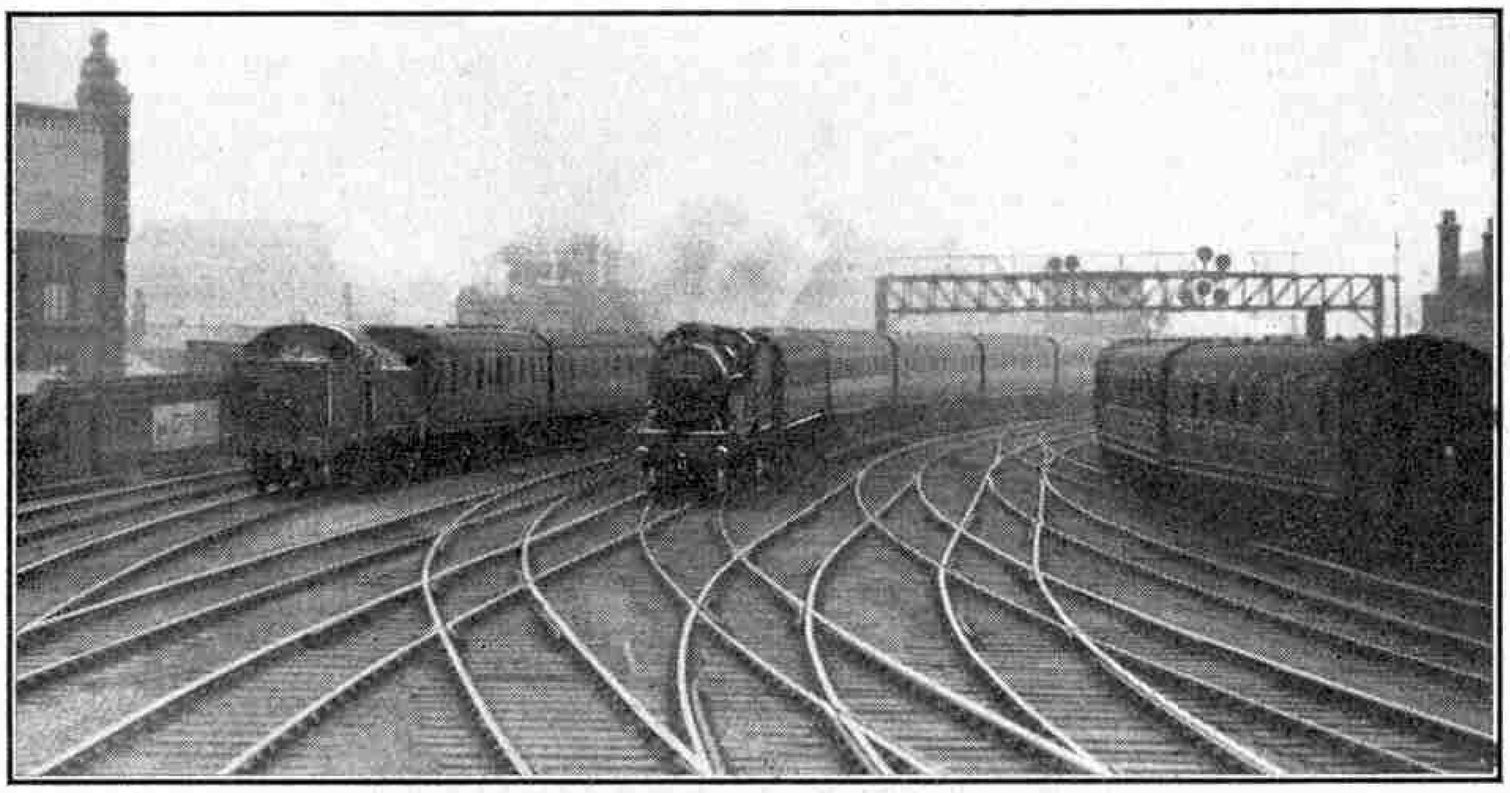
In consequence of the prevailing gradients it is not surprising that the old L. and Y. Railway built express passenger locomotives of great size and power in relation to the weight of the trains. The later types, which were taken over by the L.M.S., included the famous Aspinall "Atlantics" and the "Horwich Class 8" 4–6–0s designed by Mr. George Hughes and multiplied by the L.M.S. after grouping. Of the 4–6–0s, only 10 survive to-day, and these are in service between Blackpool and Manchester; all the L. and Y. 4–4–2 and 4–4–0 express locomotives have been withdrawn. There remain in service, however, over 200 of the gallant little 2–4–2 "radial" tanks which for many years rendered yeoman service on the L. and Y. There are also still in service nearly 350 0–6–0 and about 50 0–8–0 goods tender engines of L. and Y. origin.



Inside the signal box at Chapel Street Station, Southport. Note the miniature levers provided in connection with the electro-pneumatic signalling system.

Of L.M.S. standard engines, all types up to but excluding the "Royal Scots" and 4–6–2s are seen on the Central Division, which has through engine-workings as far afield as Glasgow. Cross-country express trains between Liverpool and Leeds or Hull are worked almost exclusively by the standard Class 5 Mixed Traffic engines, which are admirably suited to Central Division operating conditions, as the run described on page 156 of this issue shows. The formation of most of the express passenger trains is generally limited by local conditions and severe gradients, but during the peak period of the year very heavy loads have to be hauled.

At one time the "crack" L. and Y. express service was that between Liverpool (Exchange) and Manchester, the 36½ miles being timed in 40 minutes, though the trains were mostly of three or four bogie coaches only. To-day the most noteworthy express services are probably the residential trains which connect Blackpool, the Fylde Coast towns and Southport, with Manchester and Salford. High speed is necessarily not a characteristic of these trains (although there are places where they can work up to 70 m.p.h. or so), owing to gradients, service slacks, and particularly the long caution through Preston. In the evening rush period from Manchester, nine expresses leave Victoria for Blackpool district stations between 3.55 p.m. and 5.55 p.m., the chief train being the 4.55 p.m. "Club Express" to Blackpool (North). The "club" saloons attached to certain of the residential expresses between Manchester and Blackpool are a famous institution among North Country travellers. They provide club and refreshment facilities for business men on their way to or from the day's work, and only members of the travelling clubs are permitted to use them.



Suburban and express trains running abreast near Manchester Victoria. Traffic in this area is controlled by colour light signals, some of which can be seen on the gantry in the background.

Holiday traffic on the Central Division would furnish material for an article in itself. The peak periods are during the Lancashire and Yorkshire "Wakes" holidays, and during the Blackpool Autumn Illuminations. The number of special trains run to Blackpool in connection with the holiday traffic exceeds 2,500 in a typical year, and for the Blackpool Illuminations approximately 1,500 special trains are run. These trains approach Preston by six different routes, but go forward from the junction of the Western and Central Division lines at Preston over two up and two down lines only until reaching Kirkham Junction, at which point the trains for Blackpool Central, Blackpool North and Fleetwood diverge to their appropriate routes.

Another notable event is the Grand National Steeplechase at Aintree. For this occasion, about 50 long-distance dining-car trains from such centres as London, Manchester, Bristol, Edinburgh, Oxford, Bradford and Leeds all make for the large group of sidings which lie almost alongside the racecourse. Between 10.0 a.m. and 3.0 p.m. some 140 special trains, steam and electric, convey approximately 35,000 passengers to watch the race.

It does not need the additional stimulus of wakes or illuminations to make every day a busy day for passenger traffic on the Central Division. In the morning "rush hour" from 8 a.m. to 9 a.m. at Manchester (Victoria) over 40 trains arrive with some 13,000 folk bound for their daily jobs in "Cottonopolis," and in the evening peak between 5 p.m. and 6 p.m., 45 trains depart from the same station. The Victoria and Exchange stations at Manchester adjoin, being in fact connected by the longest single platform in the country, 2,194 ft.

The former L. and Y. Railway was a pioneer in electric traction in this country, having electrified its lines between Liverpool, Southport, and Crossens as early as 1904. The Central Division now operates 49¾ route miles of electric trackage (third rail conduction) in the Liverpool–Southport–Aintree and Manchester–Bury districts. The total annual train miles exceed 2½ millions and the number of passenger journeys 30 millions.

In so great an industrial area, freight traffic naturally bulks very largely in the affairs of the Division, the principal traffics including cotton, wool and other textiles; in fact cotton makes numerous journeys by train during its progress from the raw material to finished product. Then there is coal from the Lancashire and Yorkshire pits for shipment or home consumption. Machinery of all kinds and a considerable share in the important paper-making industry add their quota to the widely varying types of originating traffic; and ironwork from the great foundries of the north east passes through in considerable quantities on its way to the industrial Midlands. Among the principal cotton-handling stations Oldham ranks high, with its five L.M.S. warehouses capable of storing 40,000 bales.

At strategic points throughout Lancashire and Yorkshire are extensive marshalling yards for sorting freight traffic and making up trains for different parts of the system; two notable yards are Rose Grove, Burnley, with siding accommodation for over 1,600 wagons, and Healey Mills, near Wakefield, where 15,500 wagons are detached in a typical week.

In spite of the enormous complexity of its routes and traffic, the L.M.S. Central Division holds a very high reputation for efficient operating, this being evidenced by its splendid time-keeping record.

Modern Cranes and Universal Excavators

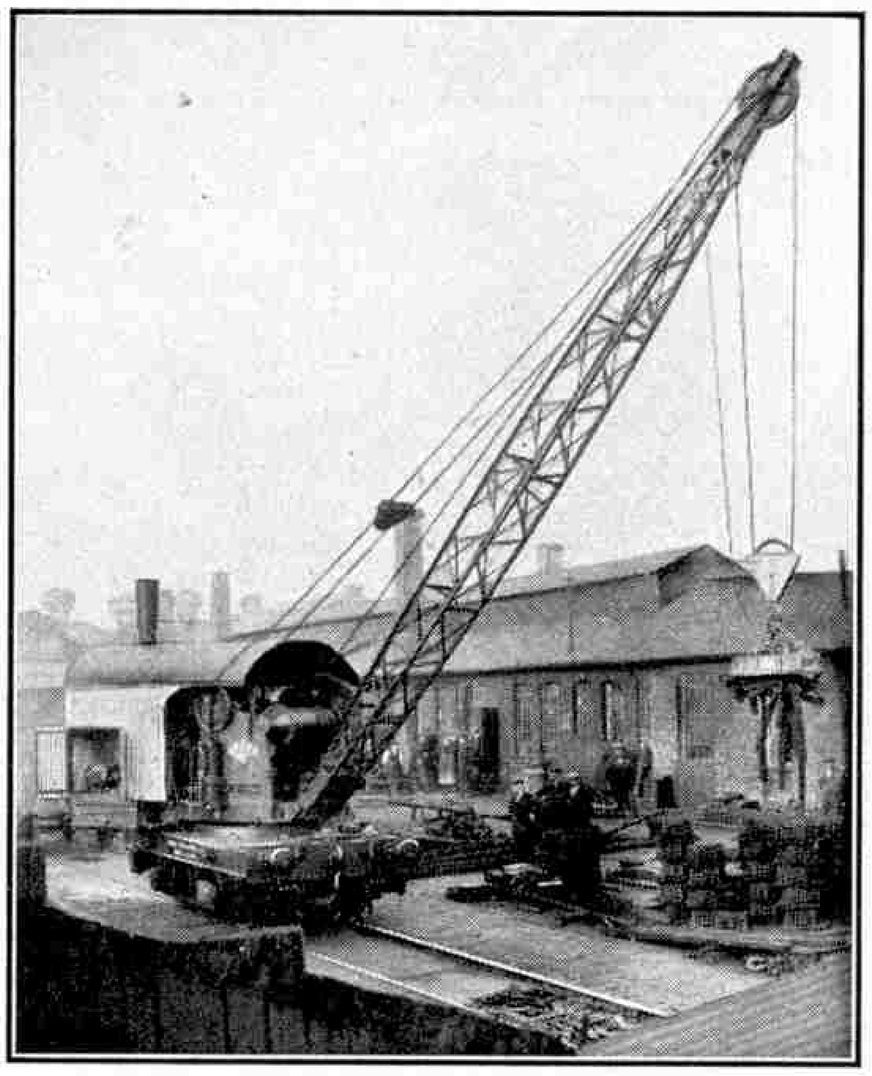
Machine With Interchangeable Parts

CRANES of all kinds play a very important part in engineering and it is safe to say that very few modern engineering structures could be completed without their aid. Cranes range in size from small ones designed for lifting only a few tons up to mammoth floating and hammerhead cranes that can handle easily loads of 200 tons or more. The giant cranes are the more impressive when seen in action, but they form only a very small group in the crane family and actually it is the smaller ones that are used most frequently in the routine work of shipyards, factories and other industrial works.

A Smith multi-purpose excavator equipped as a skimmer scoop for removing top soil. The machine can easily be converted for work as a grab crane, trench digger, navvy or dragline. The illustrations to this article are reproduced by courtesy of Thomas Smith and Sons (Rodley) Ltd., Leeds.

The smaller cranes are available in a variety of types and sizes, some designed for a particular kind of work, and others suitable for general use within their lifting capabilities. On these pages we illustrate examples of the cranes and excavators made by Thomas Smith and Sons (Rodley) Ltd., Leeds, which are typical of those in use to-day.

Most small cranes are of the transportable type, and are fitted with wheels and travelling gear so that they can be moved to any part of the works where their services are required. Some of them run on rails, and an example of this kind is shown in the lower illustration on this page. This machine is driven by a steam engine and is capable of lifting loads up to five tons at a working radius of 16 ft. It is designed for use in scrap and sheet metal stockyards, and instead of the usual hoisting tackle it uses a powerful electro-magnet, which is energised or de-energised as required by means of a controller installed in the driver's cab. The superstructure of the crane can be swivelled through a complete circle, and luffing of the jib and raising and lowering of the load are facilitated by close grouping of all the essential levers in the cab.



A 5-ton steam crane fitted with powerful electro-magnetic hoisting tackle, at work in a metal stockyard.

Cranes for interior work usually are powered by electric motors, so as to avoid the smoke and fumes of a steam plant. Another advantage of electric over steam engine drive is that it is possible to have a separate motor for each operation. Usually the current for the motors is carried by a cable that normally is wound on a spring-tensioned barrel fixed at the rear of the crane. One end of the cable is plugged into a power socket at a convenient point in the works and the other end is connected to the cable drum and thence through the centre collector to the crane switchboard from which other cables connect up with the various motors. As the crane travels away from the power socket the drum is free to turn and allow the cable to unwind. When the direction of the crane is reversed the action of the spring rotates the barrel and winds in the cable.

When a crane has to journey backwards and forwards for considerable distances, however, it is not practicable to carry the power supply to the motors by the method just described, and in one of the most frequently used alternative systems the current is picked up from underground live rails. The rails are laid between the tracks on which the crane runs and about a foot beneath the surface of the ground. An arm attached to the chassis of the crane passes through a slot in the ground, and two spring loaded pulleys on its end make contact with the rails.

Among the many different types of cranes designed for interior use in workshops one of the most popular is the overhead travelling gantry crane. This consists of a strong steel gantry that travels on rails fixed to the side walls of the workshop near the roof. On the gantry travels a hoisting trolley fitted with a motor-driven hoisting drum. The movements of the trolley and the gantry, and the lifting and lowering of the load are controlled from a cabin suspended beneath the gantry in such a position that the operator has a clear view of the load hook.

In the lower illustration on the opposite page is

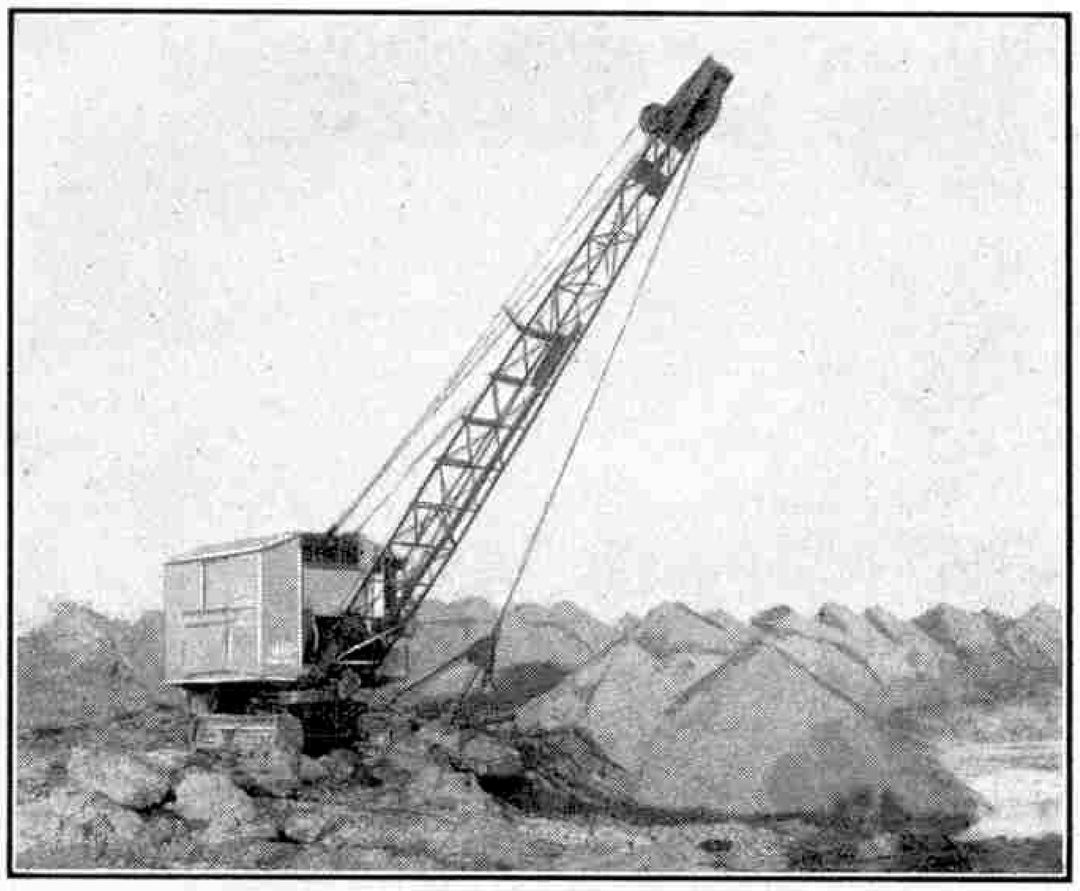
illustrated a transportable crane of a type very different from those already described. It is a level-luffing crane installed in Dublin Harbour, where it is used for loading and unloading ships. It travels on rails specially laid for it on the quayside, and will handle loads up to four tons at a working radius of 55 ft. Most cranes of this type are designed to lift only comparatively light loads, but they are capable of working very rapidly.

Derrick cranes are a common sight at quarries and on building sites, and there are probably few readers who have not seen a crane of this kind at work. Two large derrick cranes supplied by Thomas Smith and Sons (Rodley) Ltd. for quarry work can handle loads of 25 tons at a radius of 65 ft. Each is fitted with a jib 85 ft. in length, and lifts can be made from depths of 150 ft. below the level on which the crane stands, as are often required in quarry work.

Some of the Smith derrick cranes are mounted on wheeled bogies so that they can travel on rails, and to give them stability when lifting heavy loads, platforms are fixed at the base of the legs, on which bricks or other weights can be piled to act as a counterbalance.

A comparatively recent development is the multi-purpose excavator that is designed with interchangeable attachments so that it can be used not only as a crane, but also for various types of excavating work. A good example of a machine of this kind is the Smith "Three-Twelve" unit. This machine is illustrated on these pages, and by fitting it as required with the appropriate jib and other attachments provided it can be used as a navvy shovel, trencher, skimmer scoop, dragline, grab or pile driver. In the upper illustration on the opposite page it is shown fitted for working as a skimmer scoop. The soil is gathered by a scoop bucket that is hauled to and fro along the jib, which is held in a horizontal position during the cut. When the bucket is full the jib is raised and swivelled round, and the soil is dumped into a waiting truck by releasing a door in the bottom of the bucket. All these operations are carried out very quickly, and when working in earth, loose sand or gravel, the machine can scoop up about 45 cu. yds. of material an hour. The skimmer scoop jib is used also for adapting the machine for work as a trencher or an ordinary mechanical shovel.

In the upper illustration on this page the same machine is shown working as a dragline. For this work the skimmer scoop jib and bucket are replaced by a lattice girder boom, about 30 ft. long, and a dragline bucket. When fitted with these the machine is capable of removing silt from river beds, building up embankments or loading loose material at the rate of from 35 to 45 cu. yds. per hour.

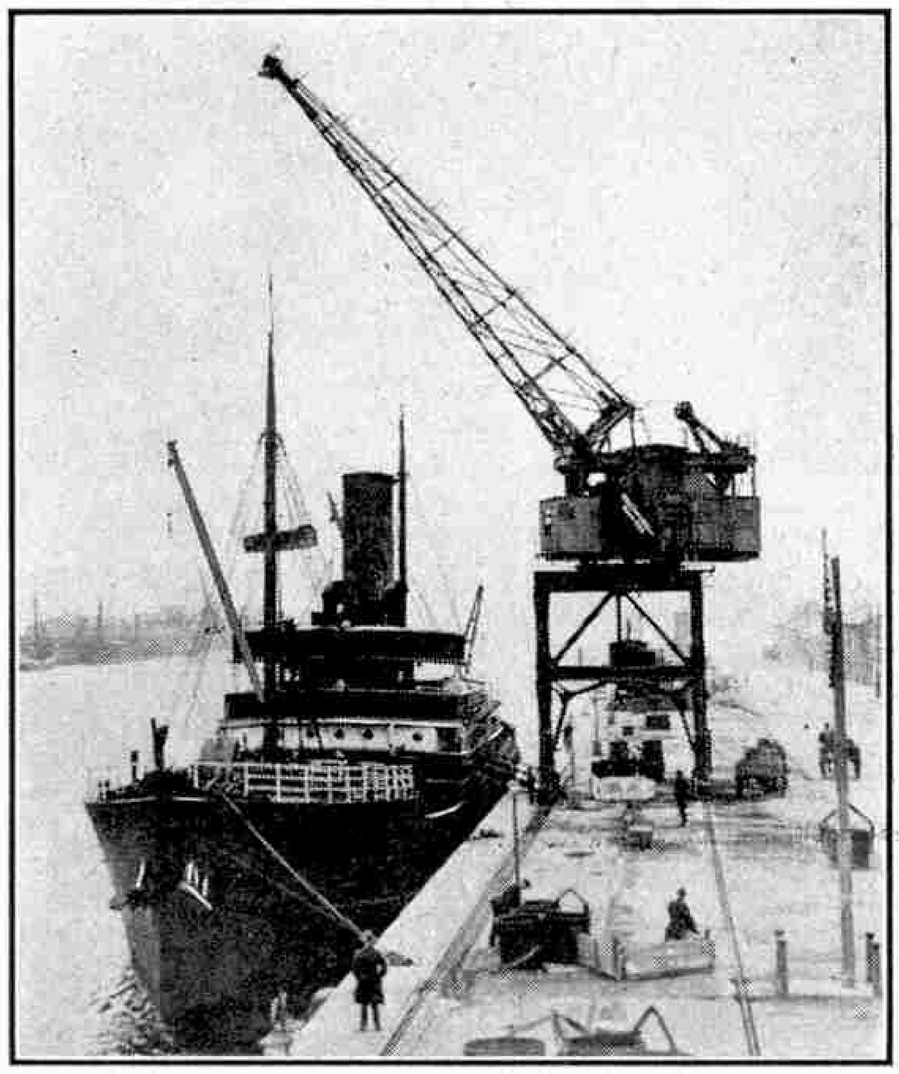


The Smith convertible excavator shown in the upper illustration on the opposite page is here seen fitted with a boom for working as a dragline.

The lattice boom is used also when the machine is working as a grabbing crane or an ordinary lifting crane, but the dragline bucket is then replaced either by a grab or a hoisting hook.

These multi-purpose machines can be driven by steam engines, electric motors, or by petrol or Diesel engines, the choice of power unit depending upon the conditions existing at the place where the excavator has to work.

When work has to be carried out on very soft or marshy ground the machines are fitted with creeper tracks so that their weight is distributed over as large an area as possible. The total weight of the machine shown in the upper illustration on this page is 12 tons, but this is so well distributed by the creeper tracks that each square inch of the ground on which the machine rests carries a weight of only 11 lb. The creeper tracks are driven from the main power unit when a petrol or steam engine is used, but in an electrically-driven machine a separate motor is often provided for this purpose, the drive being transmitted through a gear-box so that both tracks can be driven simultaneously at the same speed when the machine is travelling forward or in reverse, or at different speeds when it is desired to turn to right or left.



A high-speed level-luffing crane used for loading and discharging ships in Dublin Harbour.

The creeper tracks of a Smith excavator consist of interlocking steel pieces fastened together by nickel steel pins. Each of the driving axles is mounted in three bearings, and large springs are fitted in each track to absorb sudden travelling shocks. The superstructure of the excavator is mounted on a slewing ring of 10 tapered rollers to ensure good distribution of loading, and can be locked in any position by means of a brake specially provided. The rope barrels are mounted on the centre line of the machine to eliminate side thrusts, and are grooved to retain the shape of the rope. The barrels are of ample capacity so that there is no need for the ropes to overlap and they are operated by hand clutches. The latter in turn are operated by relay clutches, so that full power is transmitted with only very light effort at the hand levers. The drive to the rope barrels from the power unit is carried through double helical gears, which are totally enclosed and are mounted on square shafts to prevent slip.

Ten Years of Boat Train Traffic

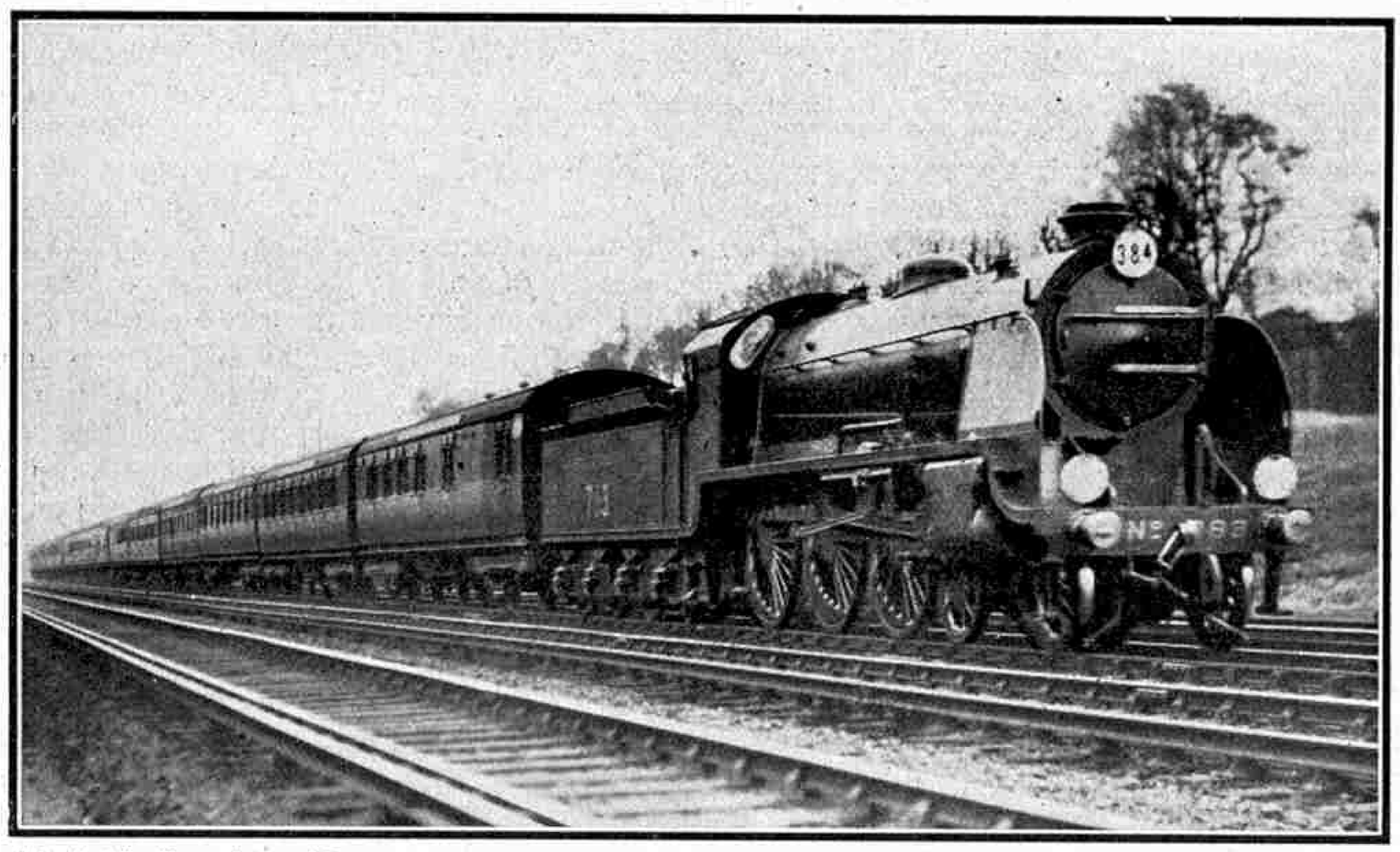
Reminiscences of a Shipping Official

By R. A. H. Weight

IN the course of more than ten years of frequent travel between London and Southampton at all seasons of the year, and at all times of day and night, by ordinary expresses, relief expresses, semi-fasts, slow trains, mail trains and boat-specials of various kinds, I gathered a fund of reminiscences. Some of my experiences may be of general interest to readers, the period covered being from 1921 to 1932.

It often struck me that it was exceedingly fortunate that Southampton had developed as the premier British passenger port, for so many visitors to these islands land there and receive their first impression of England from the carriage windows of the London-bound train. The sweeping views of the green South Downs and then the great cultivated fields of northern Hampshire stretch as far as the eye can reach between Winchester and Basingstoke. Later, the typically British villages, golf courses and residences, and miles of heathland with masses of rhododendrons in early summer, must surely create a favourable impression, which may well be capped as suburbia is reached by a brilliant display of blooms in the grounds of Carter's Tested Seeds Ltd. at Raynes Park.

There is no lack of varied railway interest either. There are Eastleigh Works, clean and bright looking; and the remarkably unbroken rise, almost entirely at 1 in 252 for 16 miles, between Allbrook Box, north of Eastleigh, and Litchfield summit, which is two miles on the London side of Micheldever at mile-post 56. The existence of only one intermediate station, Micheldever, in an approximate distance of 18½ miles between Winchester and Basingstoke, is unusual, and there are also the extraordinary straightness of the track, the number of flying and burrowing junctions, and the intensity of the electric services as the Metropolis is approached, to name only a few points.



A typical Southampton and Bournemouth express of the period covered by this article. The engine, No. 783 "Sir Gillemere," of the "King Arthur" class, is displaying the head code formerly used on this route.

West of Weybridge the line parallels the Brooklands motor track. Vivid recollections come to mind of a momentary glimpse, when looking from a down express, of a car rounding the banking at the Weybridge end at an apparently alarming angle. It would be lost to view for a few seconds before simply shooting past us on the straight, disappearing again as it rounded the next corner. Next day we learnt, perhaps, that a new speed or lap record had been achieved.

Basingstoke always gave me the impression of a real country junction. There was a constant clanging of wagons and shunting in the yard; the "wheel-tappers" plied their trade with unfailing regularity; and there was the scurrying to and from refreshment-rooms or barrows. The presence of G.W.R. engines and stock added to the interest, while the passage of an up express really fast gave that special touch of excitement which seemed to complete the picture. The line at Basingstoke is over 300 ft. above sea level, a gradual rise having been perceptible for many miles on the way from London; consequently it can at times be very bleak and wind-swept there.

One winter's morning, when I was travelling by the 5.0 a.m., "*When required, Mails, etc.*," from Southampton Docks to Waterloo, in charge of valuable import traffic, the train consisted of one old bogie composite coach and about six large vans hauled by an Adams 7 ft. outside-cylinder 4–4–0. We were held up for some time immediately after crossing the flying junction that carries the up Bournemouth line over the West of England tracks. It was silent, pitch dark, frosty and distinctly misty. Our guard received the following startling message from the signalman at Worting: "There has been a pitch-in ahead and you will go forward on the down main as soon as a pilotman arrives." Eventually we were set back on to the down through road and proceeded cautiously.

Just at the west end of Basingstoke platform on the up fast line a box van was up-ended and several other units of a goods train were badly disintegrated. Succulent-looking sides of bacon were strewn about on the frosty ground between the two main lines. The glow from one or two engines that apparently were involved added to an eerie picture, but fortunately for us it was not very serious.

It was only very occasionally that anything in the nature of a long fast run, such as that from Southampton to London, on a light special train was made by a veteran Adams 4–4–0. There were by then not many of them left at Eastleigh shed, while the duties of those surviving were usually confined to local Hampshire work.

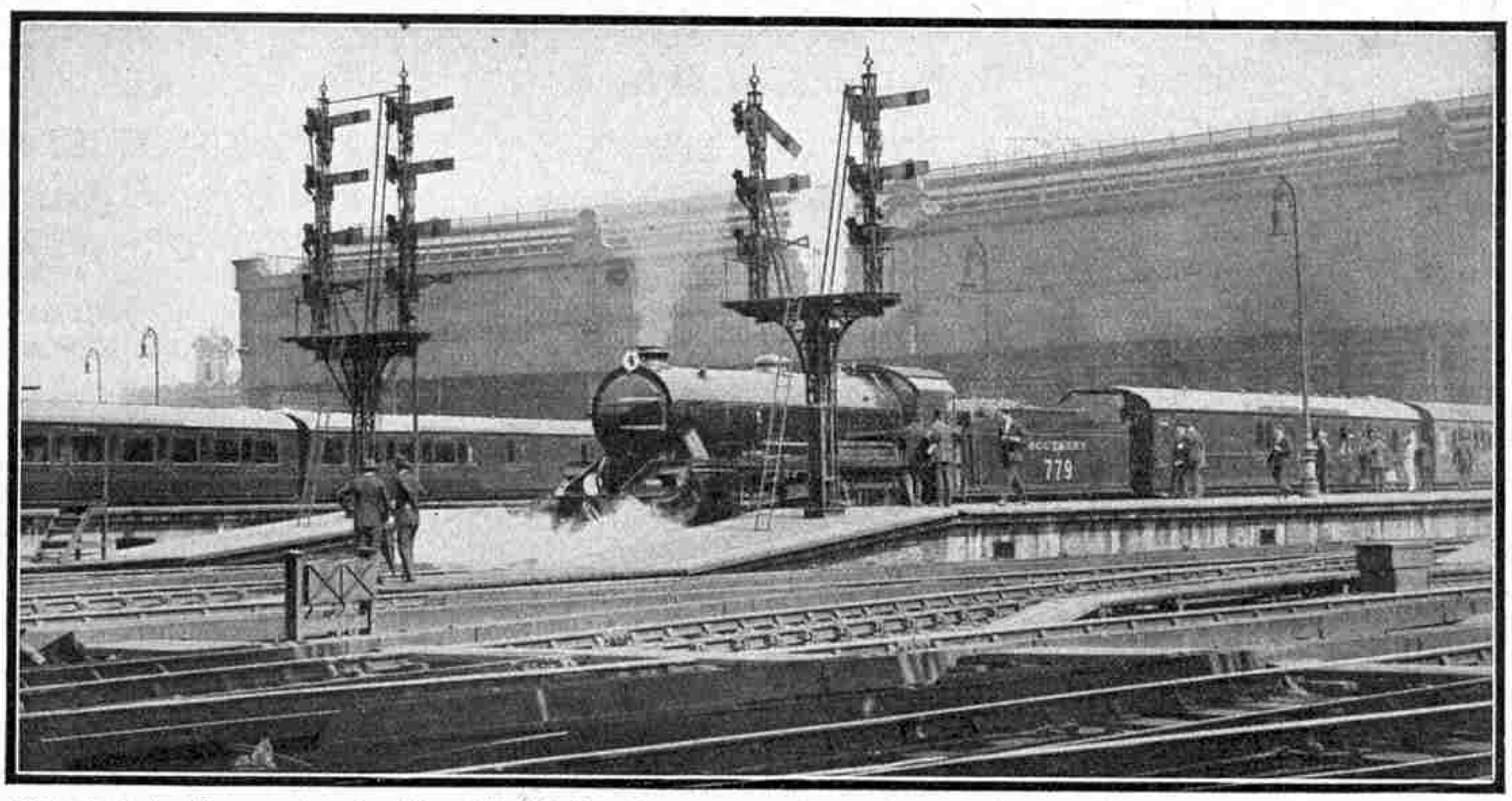
One morning at Eastleigh, another interesting but purely "Western" junction, the first Urie 4–6–0 express engine, No. 736 "*Excalibur*," and the G.W.R. 4–4–0 No. 3255 "*Excalibur*" of the "Duke" class, went southward from the down platform side by side. The former was hauling a semi-fast from London to Bournemouth, while the elderly "Duke" was branching off to Portsmouth, via Fareham, with a through train from Newbury.

Boat Trains! Waterloo has long been famous for its handling of vast extra crowds. It is the London terminus whence so many race-meetings, sports grounds, naval and military centres and so on are reached, and is constantly liable to almost any number of additional trains. It is, however, the very valuable additional traffic between London and the railway-owned Southampton Docks in connection with Ocean Liner and cross-Channel services, that presents many points of interest to the railway enthusiast. During the years of my own association with it the Boat Train traffic, generally speaking, grew enormously from its limited post-war volume. Growing prosperity, increases in the number of British and other lines using the port, and in the number of vessels, their size and capacity, and the extension of cruising and tourist travel, all contributed to that end.

Passenger boat trains as I observed them consisted of anything from four to thirteen corridor coaches varying considerably in composition of vehicles and, in many cases, conveying a "tail" of two or more vans for baggage and mails. It was usual for one of the coaches to be equipped with a pantry in order that refreshments might be served in the compartments by the catering contractors' staff. More recently on many of the specials the Pullman Car Company Ltd. have provided this service, and also a proportion of the seating capacity in their cars, with a consequent increase in the tare

weight of the train and in the work required of the engine.

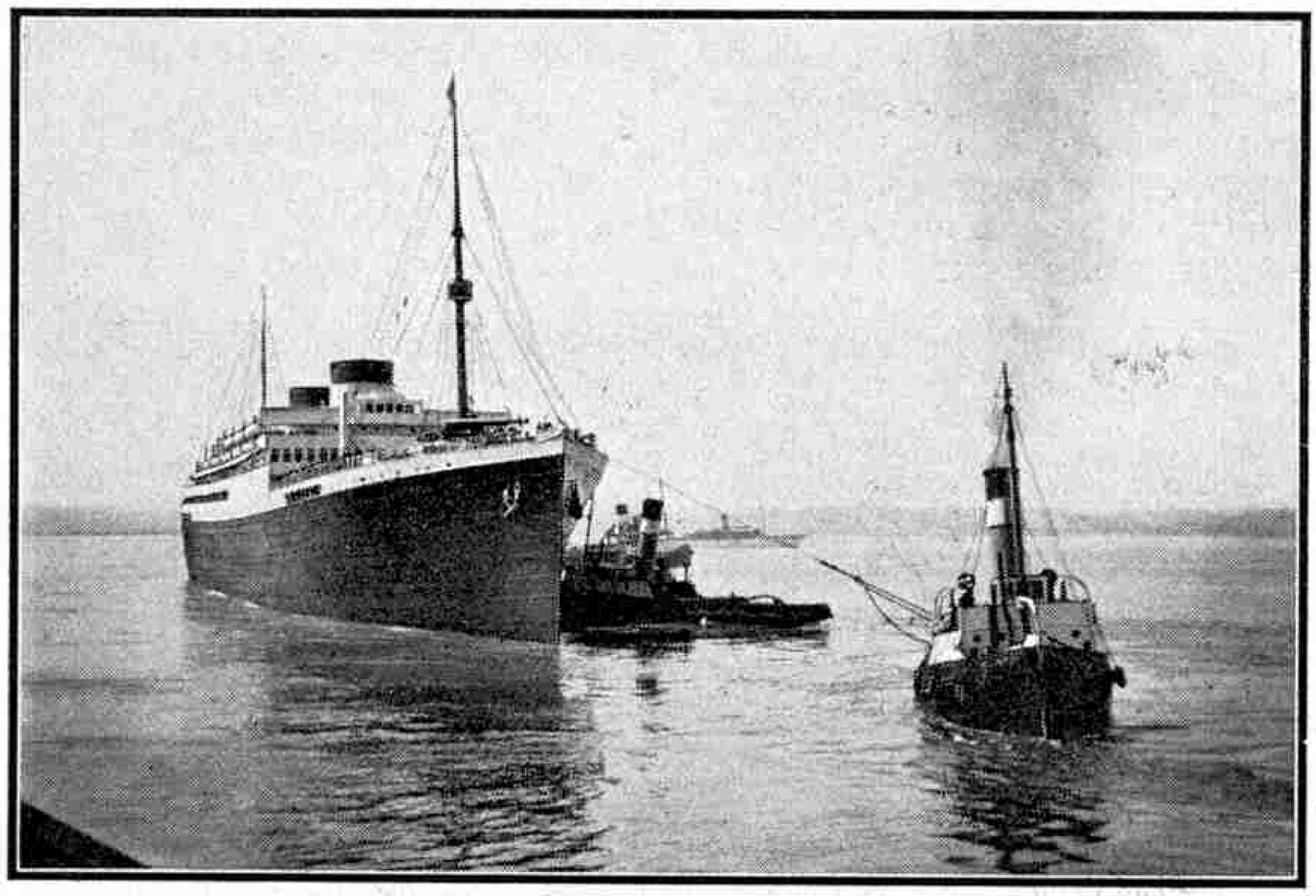
There are numerous scheduled "paths" between London and Southampton that are available throughout the day, and to one of these all specials must be worked. Several paths are regularly utilised for certain lines on set days of a week or month. Incidentally the departure time from Waterloo advertised by the shipping companies is usually earlier than the working hour. The customary allowance is about 95 minutes for the 79¼ miles from Waterloo to the dock gates, which are approximately parallel with the concourse of Southampton Terminus station. This does not sound an exacting booking over a moderately-graded road, but as loads, engine types and traffic density vary so considerably, it is doubtless advisable to standardise a schedule within average capacity. Certain paths are not available on Saturdays or during the operation of the summer service.



Waterloo before the recent re-signalling of that station. An express is leaving for the West in charge of "King Arthur" class locomotive No. 779 "Sir Colgrevance." This view was taken in 1926, when the "King Arthurs" were new.

On a typical journey a down Boat Train, having reached what may be called the outer dock gates on the northern or inland side of Canute Road, would halt, or at any rate slow down to walking pace, for it had arrived at the limit of the normal operating area. A docks pilotman boarded the engine and a constable armed with a large and raucous bell, which always reminded me of a muffin man, warned road traffic to halt before the gates. So the Boat Train crossed the public highway, passed through the southern or actual dock gates used for railway traffic only, and reached the domain of the Docks and Marine Department, a vast and highly interesting area.

By means of hand signals, heavy engines, coaches and goods trains are manœuvred over crossings and perhaps a swing bridge to and from all berths, as the network of track layout is remarkably comprehensive. A fine view of the docks and the larger vessels is often obtainable from the train during its progress to the appropriate covered shed that flanks each berth. Engines are turned by running round a triangle of lines near the inner end of the docks; during the process they cross the principal thoroughfare from the main gates.



The Cunard White Star M.V. "Britannic" at Southampton. The vessel was photographed, when leaving for New York, by our reader Mr. J. W. Billinge, Brighton.

Shunting of all kinds entirely within the docks is mainly performed by 14 side tank 0–4–0 outside cylinder engines of class B4 which were built by the L.S.W.R. at Nine Elms Works, London, in 1891–3. They bear names of Continental and Channel Islands districts or ports served by the railway steamers. One of them, No. 101, "*Dinan*," is however a mere youngster of only 29 summers, having been turned out in 1908, or about two years before Nine Elms Works were closed for removal to Eastleigh. Their only handling of passenger stock occurs normally when they are employed for shunting boat trains or mail vehicles to or from sheds and sidings, or perhaps for heating them, but I have travelled behind several of these useful little chaps on special trips within the dock area, which is divided into sections for shunting purposes and possesses its own marshalling yard. Two small ex-L.S.W.R. tanks formerly used for rail-motor work, which are now numbered in the duplicate list as Southern Nos. 3741 and 3744, also came on the scene during my later visits.

The incoming liner provides a more uncertain problem for the railway operating folk than her outward-bound sister. Numbers of passengers and other necessary details are received in advance by cable or wireless, so that the shipping companies notify their train accommodation requirements. Regular though modern ship services now are, however, it is impossible to forecast the exact time at which a vessel will be fast alongside and will receive the "O.K." from the Port Officers. The last-named formality, known internationally as "granting pratique," is usually most promptly carried through, but the greatest enigma is the length of time that will be required for the landing of passengers, the clearance of their baggage through Customs, and the orderly stowage of persons and belongings in the train. Thanks to the swiftly operating electric cranes, coupled with a perfected organisation on board as well as ashore, huge quantities of baggage and mail, also sometimes items of highly urgent or valuable cargo, can be discharged in an incredibly short time after a ship docks.

The scene in the shed between vessel and train about half an hour or so after a large liner has berthed is of great and colourful interest. Within another hour the shed is probably becoming deserted, the Boat Train is loaded as per labelled seats and compartments; van baggage is stowed in alphabetical groups according to passengers' surnames on lettered labels. The main line engine is on; and after much preliminary blowing of whistles, with the inevitable last-minute dash on the part of some passenger who has been detained by the Customs or Immigration Officers, or of one who thinks he has lost his luggage, a move is slowly made towards the dock gates in charge of a pilotman. Such a man œuvre may be lengthy, involving a shunt-back perhaps as well as the negotiation of busy level crossings. Meanwhile the control office has received telephonic notification and is arranging the path over the main line.

I found it interesting, when accustomed to these workings and the regular timetable, to speculate according to the time of leaving the berth as to how long a special would take to Northam Junction, and also of course to Waterloo. One hour and forty minutes was the usual allowance for up Boat Trains from the Docks to London, but there was always an element of chance as to a clear road.

HOW THINGS ARE MADE:

Lenses for Cameras and Projectors

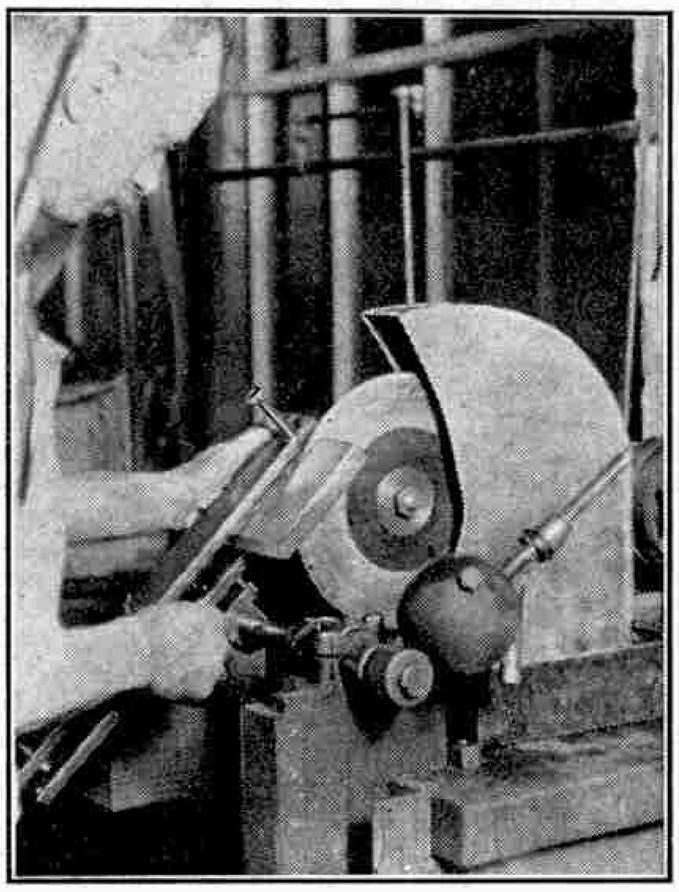
By Arthur Cox, B.A., B.Sc.

TWO things are meant by "making lenses." The first is the design of a lens, the choosing of glasses, their thicknesses and curvatures; the second is the actual process of manufacture in turning out camera lenses, and lenses for other purposes. Both aspects can be dealt with by following the progress of a lens, from its beginning as an idea in the mind of the designer to the stage where the finished product is ready for despatch.

The simplest form of lens is the burning glass, a piece of glass with curved faces by means of which light from a distant point is brought to a focus in a small disc. The fact that this disc may be of appreciable size means that such a lens cannot be used for photographic work of very high quality. More complicated forms of lenses consisting of a number of component glasses must be used to get fine definition.

The general layout is chosen according to the purpose for which the lens is required. Thus the general arrangement of glasses in a lens for photographic work is different as a rule from that in a lens used for projection work. Special calculations are then necessary to choose the curves for the glasses, and the accurate separations and thicknesses. When the designers consider that the curves and separations chosen are the best possible, a chit giving particulars of the lens is prepared. This includes a sketch of the components, with the radii of the curved surfaces, and specifies the kinds of glass to be used. This chit is handed to the glass side of the optical factory so that a model lens may be made.

The optical glass used is of special quality. It is very important that it should be free from unevenness and colour, and less important that it should be free from air bubbles. Glass of the high quality necessary is made only by a few famous makers. It reaches the factory as a rule in slabs, which are first sawn up by means of a diamond saw consisting of a circular plate of thin sheet iron, about a foot in diameter, the edge of which is charged with finely crushed diamond. The fragments of diamond embedded in the soft iron act as saw teeth and cut through the glass very quickly. A saw of this type is shown cutting a block of optical glass in the upper illustration on this page.

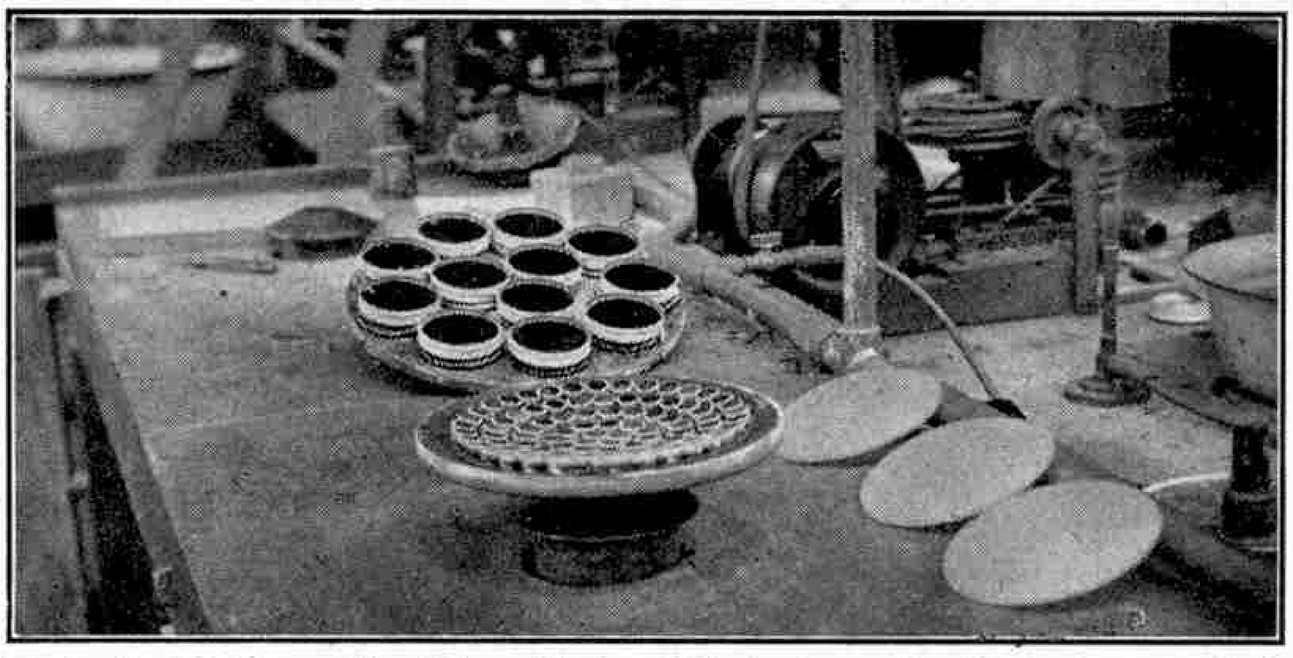


A diamond saw cutting a slab of glass. The saw is a circular plate of sheet iron with finely crushed diamond on its edge.

The pieces of glass now obtained have straight line edges, and as a rule are square; and the next thing is to shape them so that they are approximately round. This is done with a rough pair of iron scissors or shanks. The corners of the glass are chipped off quite accurately, although the process is rather more difficult than it sounds.

The next stage is known as "roughing and trueing." The approximate curves needed are rough ground on the bits of glass of about the right size. This is done by holding the glass against a spherical tool made of soft iron, of about the correct radius of curvature for the purpose. If a concave surface is required on the lens the glass is held against a convex tool; for a convex surface a concave tool is necessary. The tool is rotated rapidly and fed with a mud made of coarse emery, and on it the glass is worked backwards and forwards, and constantly twisted round so that it is ground equally in all directions. After this grinding the thickness of the glass is measured to make sure it is about that stipulated by the designer, with enough to allow for the removal of more glass in later processes.

The surfaces of the glass at this stage are rough and the lens is not transparent. Fine grinding then follows. This is done on rapidly revolving brass tools, the lens being twisted and rolled about in all possible positions. Very fine emery is used, and the tool is kept just moist so that the glass adheres strongly to the tool, with just a thin separating film of emery mud. When the fine grinding is finished the surface of the lens is still opaque, but of a smooth and silky texture.



Blocks of polished lenses. The pitch used in the polishing process makes their surfaces seem black.

The lens is now ready to be polished. This process is really the same as grinding, but is much slower and involves greater skill and accuracy. Rouge or putty powder is employed in place of emery, and instead of a tool of soft brass or iron, one carrying a thin coating of specially prepared pitch is used. The pitch is spread as an even layer on a brass tool and accurately moulded when hot by the actual lens to be polished. As a rule the pitch is scored to retain the powder.

When the lens is to be polished singly it is mounted with pitch on the end of a wooden holder. It is more economical, where it is possible, to polish the lenses in nests or blocks, which may be done when the surfaces are not too curved. Those that are to be polished in this manner are also fine ground in a block. They are attached with pitch to an iron centre and arranged so that, as far as possible, the surfaces of the rough-ground lenses form part of one sphere. The fine-grinding of the block lenses continues until every single lens surface in the block is accurately a part of one sphere of the necessary radius.

Hand polishing tiny lenses for use in photomicrography. The polishing is carried out with rouge or putty powder, which cuts off the uneven parts.

In the polishing process the putty powder or rouge moistened with water is painted on the pitch polisher, and this is rotated rapidly, while the individual lens or block of lenses is worked backward and forward, and rolled round in all possible positions. It requires considerable skill and experience on the part of the workman to get an even polish, and absolutely perfect sphericity all over the surface. The grey surface of the fine ground lens is polished by the rouge cutting off the fine uneven parts.

The pitch on which the lenses are mounted makes their surfaces seem a glistening black, as can be seen in the lower illustration on the opposite page, which shows polished blocks of lenses, and in the upper illustration on this page.

When the lens is sufficiently polished to have a smooth, highly reflecting surface it is tested to make sure that its curvature is correct. The test is made by using a glass proof plate of the standard curvature required. The polished surfaces of the lens and the proof plate are cleaned, and the glasses are then carefully slid together, great care being taken not to scratch any surface. When the curvature of the lens is about right there is only a very slight air film between the two surfaces, and there coloured fringes or bands are formed. These are rather like the coloured rings obtained from a thin film of oil on water, and are caused by the interference of the light reflected from the surfaces that are almost in contact. They are known as "Newton's rings," because they were first observed and studied by Sir Isaac Newton.

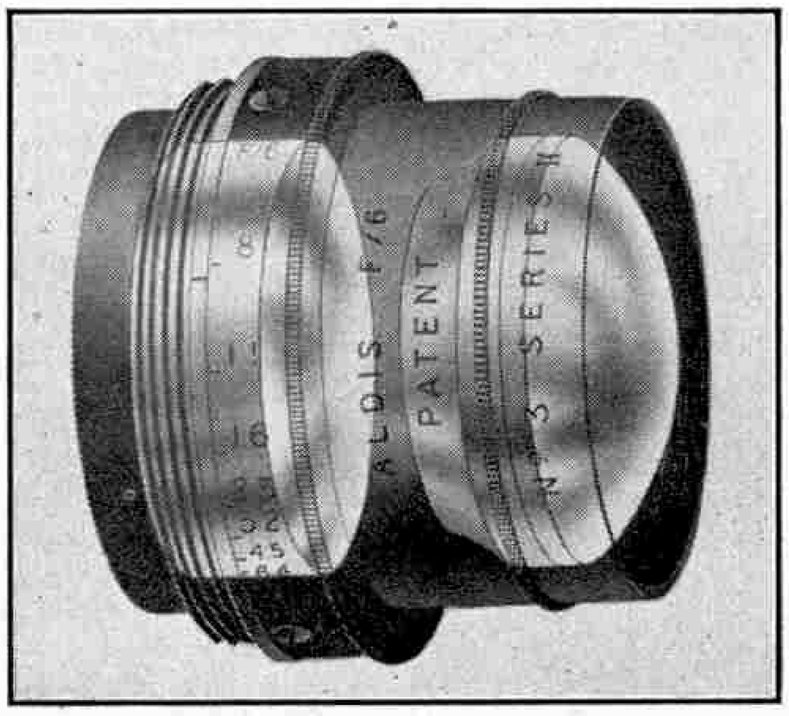
When there is a broad band of colour all over the proof plate, there is a good fit to within a few millionths of an inch. This is a very accurate determination of curvature. Individual lenses that pass this test cannot differ by an amount sufficient to have a noticeable effect on their optical performance.

If the lens does not fit the proof plate it is repolished with a stroke that tends to make it either deeper or shallower. The lens is moved, for example, in a longer to-and-fro path, or a different pressure is applied. It is skilled work to get the polishing well done, to fit the proof plate and lens to a millionth or two of an inch.

When both surfaces of the lens have been polished the lens is ready to be edged. It is important to get the ground edge of the lens true with the lens surfaces, otherwise the lens will behave as if it were tilted when it is finally mounted, and this would spoil the definition. The lens is attached to a lathe spindle by a special cement of shellac and pitch. It can be moved about while the cement is hot, and is so placed that the images of a bright point seen in both surfaces of the lens are stationary while the lathe spindle is turning. When this is the case the centres of both the spherical surfaces of the lens are on the axis of the lathe, and then the lens is edged down to the diameter required. By this means the edge is ground true with the spherical surfaces of the lens.

At each stage of manufacture the lenses are examined to make sure that no faults creep in, such as chipped surfaces, or scratches after polishing, or glass showing signs of strain.

The lenses are now ready for matching. Their thicknesses cannot be reproduced to sharp limits with the same precision as their radii, and may vary by about a tenth of a millimetre or less. These are measured, and by rules given by the designers those that are slightly different from the standard thickness are matched for use together in the same lens mount.



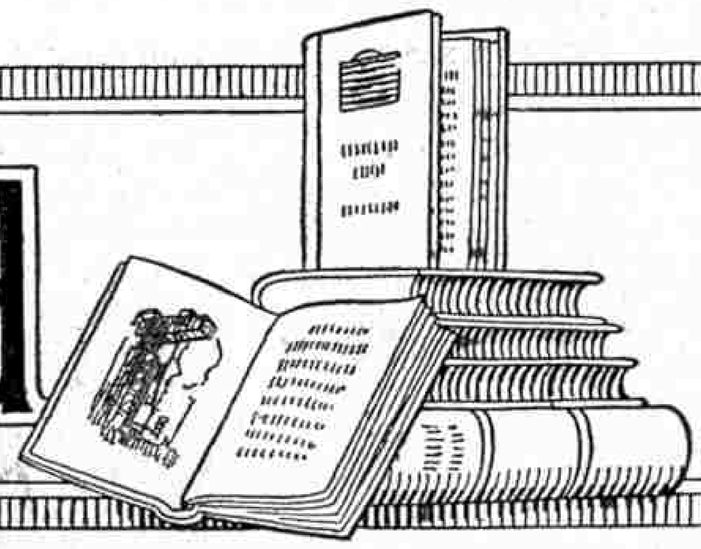
The 5¾ in. F.6 Aldis lens, with which the photographs illustrating this article were taken.

In some cases two or more lenses are to be cemented together to form one lens. This is done with Canada Balsam. One lens is fixed with pitch to the spindle and made to run true. The pitch is then allowed to harden, and the second lens is then waved about over the surface of the first until it in turn is running true, as gauged by the reflection of a bright point. The Balsam is then allowed to harden.

At the same time as the chit is handed to the glass side of the factory, another showing a design of lens mount and cells to hold the glasses is passed to the metal side. The lenses are now burnished in their cells, by turning over a thin lip of metal. The cells are then put in the mount, and the lens is ready for testing.

A model lens undergoes a long and searching test, and modifications are made until it gives full satisfaction. When the lens is in routine production each is carefully adjusted so that any very slight errors of centering are eliminated. This centering should not be upset by the user; if by any chance, such as by rough handling, it is disturbed, then the lens should be returned to the maker for recentering.

Books to Read



Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/– for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

"The Wheel"

By Vernon Sommerfield
(Nicholson and Watson. 12/6 net)

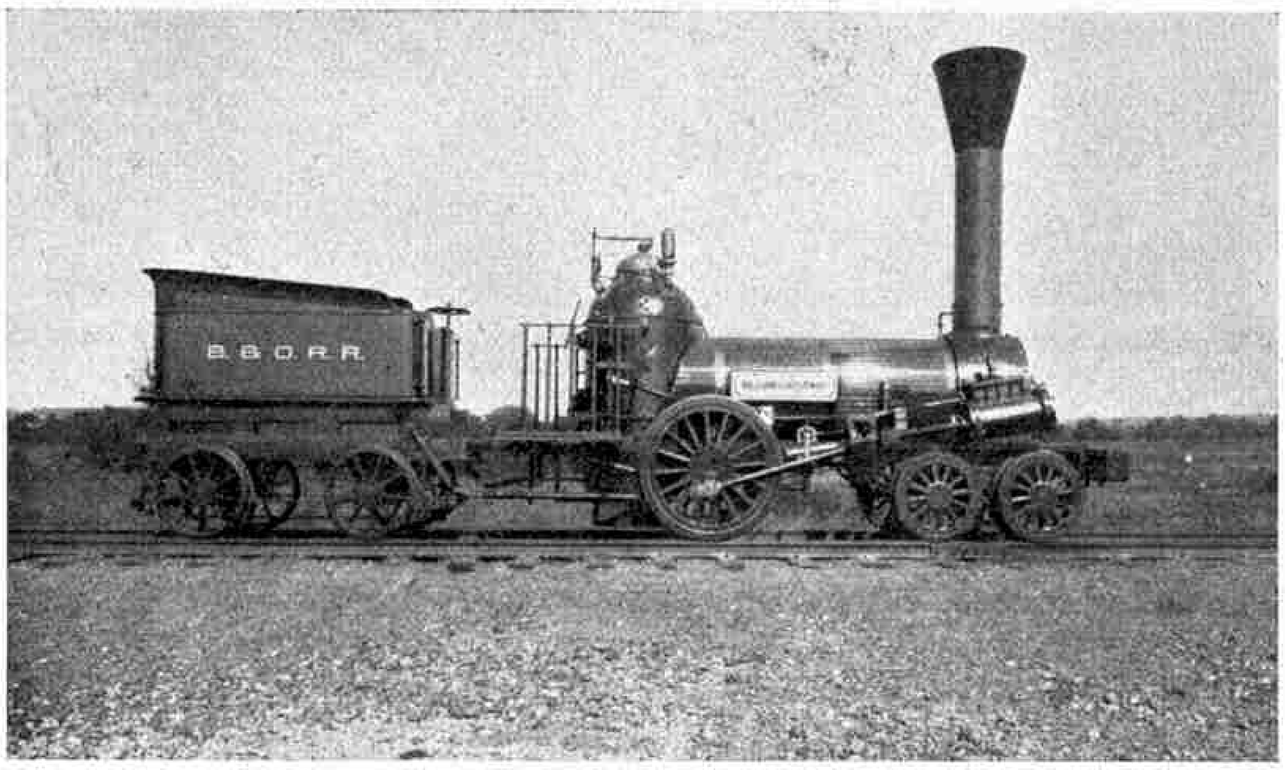
Mr. Sommerfield has here told the story of the use of the wheel in transport through the centuries. His book is full of reliable and interesting information, and is one that will be thoroughly enjoyed by every "*M.M.*" enthusiast who reads it.

In a preliminary survey the author traces the origin of railways to the Babylonian trackways of 15 centuries ago and follows later developments through the roadways of Greece and the narrow gauge mining tracks of central Europe, which formed the starting point for the modern form of the iron road. We are given a comprehensive account of the development of English colliery tramways, which first appeared in the Newcastle district a little over 30 years ago, and see how the growth of industry led to the need for power. How this was met by the application of the steam engine is well described, the story being told briefly from Trevithick's pioneer locomotive experiments to the opening of the Stockton and Darlington Railway.

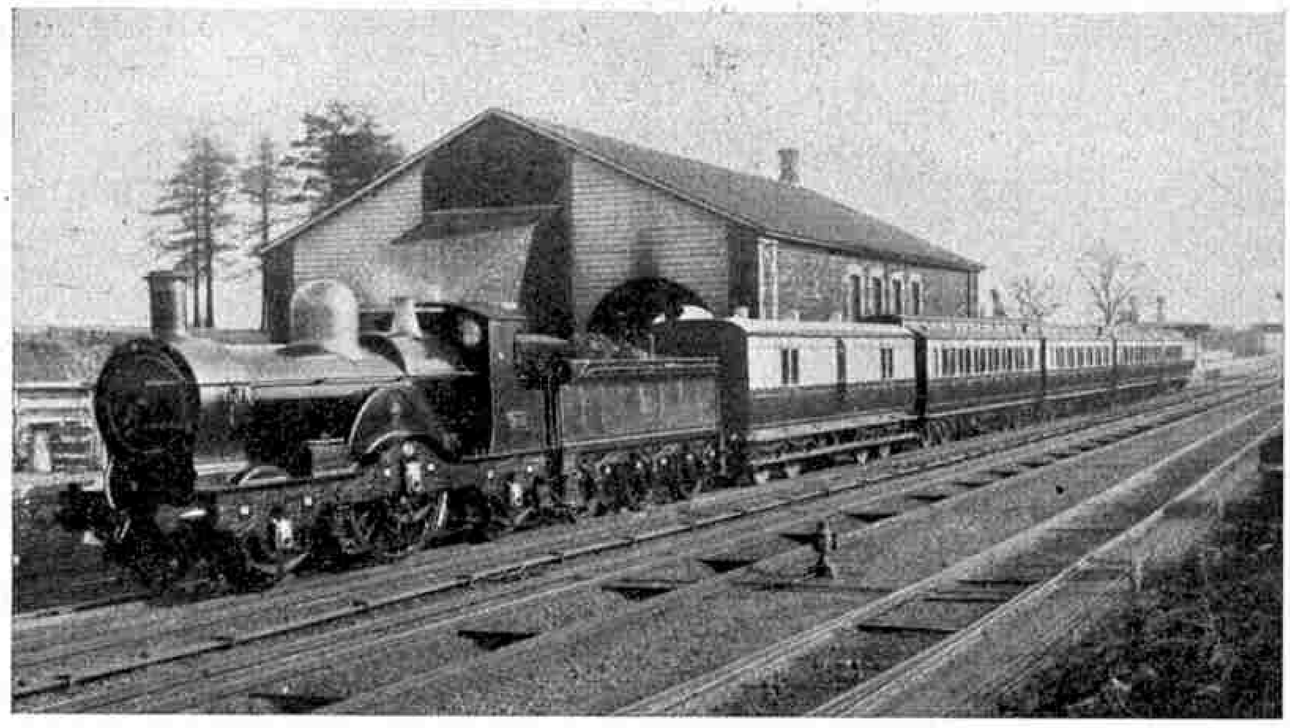
The wonderful developments of the last 100 years are next dealt with in a series of chapters of absorbing interest. We begin with the stage coach, the development of which is followed from the appearance of the first hackney cabs to the time when a network of coach routes covered the country and the service was speeded up from time to time, just as railway services are in our own days. The change from road to rail was not made in a day, but eventually the stage coach had to give way to its rival; and for his last picture, a very vigorous one, of the older era, the author turns to the pioneer days of the far west in America. Then we come to the railway age. There is no more fascinating story than the growth of high speed transport by rail, and it is told admirably by Mr. Sommerfield, who carries his readers forward from the "*Rocket*," which startled onlookers at the Rainhill trials of 1829 by travelling at 30 m.p.h., to the record-breaking L.N.E.R. locomotive "*Mallard*," which attained a speed of 125 m.p.h. last July.

Power on the roads is the next topic. Here again there have been rapid and amazing changes. We see how horses, steam engines and electric and petrol motors in turn have been applied to vehicles of various types, and this leads naturally to the story of the road itself. A section follows on the progress of electrification on railways, both suburban and main line, after which we return to the road and are given some interesting suggestions for further developments in the interests of speed and safety.

At the end of the book there is a useful chronology of land transport, which enables the reader to visualise in outline the whole of the story told by the author, together with a useful list of specialised books. There are 16 full-page plates.



A Baltimore and Ohio locomotive of 1837, a typical engine of its time. This illustration and the one below are from "The Wheel," reviewed on this page.



The first corridor train run on the Great Western Railway. This was in 1892, the year in which the last was seen of the old broad gauge.

"The World of Engineering"

By J. L. Dixon. (The Scientific Book Club. 2/6 net)

This is a further volume in the Scientific Book Club series, available to members at the low price of 2/6. It is intended to give readers facts that form the background for the work of the engineer. Power units and the production of iron and steel are first dealt with, after which the author turns to various branches of civil and electrical engineering, including telephony, radio and television.

The book contains much useful information, but is not one that we can really recommend. In places the text is difficult to follow, and certain sections are dull and uninteresting. A further complaint concerns the account of the locomotive. This brings the story down to Hackworth's engine "*The Royal George*" of 1827, and then makes a prodigious leap forward to the opening of the Great Northern Railway in 1850, thus ignoring the appearance of the "*Rocket*" at the Rainhill trials in 1829 and the great developments of the following 20 years. In another sphere we have a chapter on television in which the cathode ray tube is scarcely mentioned, and no idea is given of its fundamental rôle in modern television. Considerable revision and rewriting would be necessary to bring this book up to the high standard of previous Scientific Book Club volumes that we have had the pleasure of reviewing in these pages.

"Smugglers of the Rome Express"

By Frank Elias. (R.T.S. 2/6 net)

The hero of this vivid yarn is a boy of eighteen who has never been out of England and is thrilled by the prospect of a journey in the Rome Express. His ardour is damped a little by the unwelcome presence of a cousin who, unknown to him, is a member of an unscrupulous gang of smugglers. Then at night he discovers an empty compartment, with the window wide open and blood on the floor. From that moment he knows too much about the smugglers, who stop at nothing to achieve their ends, and can expect no mercy from them. How he escapes, is recaptured, and escapes again from death when he himself had given up hope, makes an extremely exciting story.

"Gold Nugget Charlie"

By Frances Lloyd-Owen. (Harrap. 10/6 net)

This fascinating story of adventure is not a mere yarn, but is the actual career of one of the pioneers of the goldfields of Klondike and Alaska. Gold Nugget Charlie earned his nickname by his success in finding several small nuggets during his first day's work on the sand bars of the Yukon at Forty-Mile. He was then still a boy, but had already experienced more thrills than fall to the lot of most men in a lifetime. At the age of 12 he ran away from his home in Baltimore and travelled west, stealing rides on trains, until he crossed the Missouri River. There he took part in battles with the Sioux Indians under the famous chief Sitting Bull. Later he became a mail rider, and then joined a wagon train of which Buffalo Bill was one of the guides. Indians captured him, but he escaped and eventually reached Alaska in an Arctic whaler, deserting when the vessel put into port and making a lonely sledge journey to the goldfields, during which he was threatened repeatedly by packs of hungry wolves.

Gold-mining was the chief occupation for the rest of Gold Nugget Charlie's life. He had made a small fortune long before the great rush of 1898 started and was one of the few who shared the first riches of the Klondike. He met many strange people, and had exciting adventures enough, in the end losing everything he possessed. Then he set out on a desperate venture to the shores of the Arctic Ocean in search of gold, and was nearly frozen to death in a blizzard. While following his fortunes the reader comes to see how men lived and worked on the goldfields of Alaska and Yukon, and to understand the gold fever that kept Gold Nugget Charlie there to the end of his career.

The book has 36 half-tone illustrations, from actual photographs, including two portraits of Gold Nugget Charlie himself.

Sluicing in progress in the Alaskan goldfields. The man with the spade is Gold Nugget Charlie, the story of whose life is reviewed on this page.

"The Lair of the Bird-Men"

By Eric Townsend
(Harrap. 3/6 net)

This is the story of the struggles between rivals in search of the buried treasure of the Incas in South America. The treasure is in an almost inaccessible place in the Cordillera Range, and before its discovery there are many exciting fights between the rivals, with surprising turns of fortune in which a great part is played by the bird-men, a strange race of dwarfs who have tamed condors and fly through the air on their backs. The final scenes, in which the waters of a great lake rush in an overwhelming torrent through a gap made in its banks, are particularly exciting, but there is never a dull moment throughout the story.

"Angling: Coarse Fish"

By L. W. Clark. (Bell. 2/6 net)

There must be many readers of the "*M.M.*" who are anglers themselves, or are interested in angling, and for them here is a book that can be thoroughly recommended. Mr. Clark is a veteran who is chiefly attracted by the sporting side of angling, and although he includes a short chapter on cooking the catch, he seems to advocate returning fish to the water, believing, in his own words, that "no one besides our noble selves cares two hoots what we catch and, for ourselves, is not a memory better than a dead fish?"

The author tells his story with a pleasant humour, and yet is very thorough and practical. He begins with concise descriptions of the fish with which he is concerned, passes on to baits, rods, lines, reels and other necessary equipment, and then brings out the finer points of the sport itself in chapters following the sequence of events in fishing in streams, ponds and the sea. Many excellent line illustrations of fish and of fishing tackle are included and add to the value of the book.

"The World's Airways"

By Robert Finch. (University of London Press. 5/-)

This book tells in an easy style the story of the amazing growth of commercial flying. In 1908 there was not an air service in existence, but by 1938 "the world's network of airways totalled over 300,000 miles"; and there are plenty of indications that during the next 30 years even more remarkable progress in air transport will be achieved.

At the outset of the development of civil aviation the nations interested realised the need for regulating flying, and the author tells how international conferences on air navigation accomplished this. Naturally he gives prominence to the story of British air transport, and after relating briefly how Imperial Airways came into being in 1924 he describes the growth, stage by stage, of the great Empire air routes that link this country with Africa, India, and Australia. His accounts of actual flights over these routes, and of the aircraft used, give vivid pen pictures of the comfort, speed, and fine organisation of modern air travel.

British internal air services are reviewed, and the history and chief features of commercial flying in the Dominions are related in an interesting way. The author then records the history of air transport in other countries, includes attractive accounts of journeys by flying boat, airship, and giant air liner over some of the long-distance routes mentioned.

A specially interesting chapter deals with transatlantic air services. After describing the Deutsche Luft Hansa service to South America by the South Atlantic route, the author passes to the successful experimental North Atlantic flights made by aircraft of that company, Imperial Airways, and Pan American Airways, and touches upon future developments.

The book is illustrated by many excellent half-tone photographs and useful maps.

A transcontinental air liner flying over the Grand Canyon of the Colorado, in Arizona. From "The World's Airways," reviewed on this page.

"Every Boy's Book"

By H. L. Gee
(University of London Press. 5/- net)

For every boy who asks questions and wants to know things, here is a splendid book of a new type that gives direct replies or suggests how the answers can be found. The book indeed is an "Enquire within" specially planned for the modern boy, telling him about aeroplanes, locomotives and ships, introducing him to hobbies of all kinds, and giving concise practical information about careers, health and first aid, camping and cooking, and animals and pets. Sports are not forgotten, and there are useful notes for schoolboys, and even examination hints!

Fun is mixed with seriousness in the volume, for it includes jokes, tricks and teasers. The book is well illustrated.

HORNBY-DU

GAUGE 00

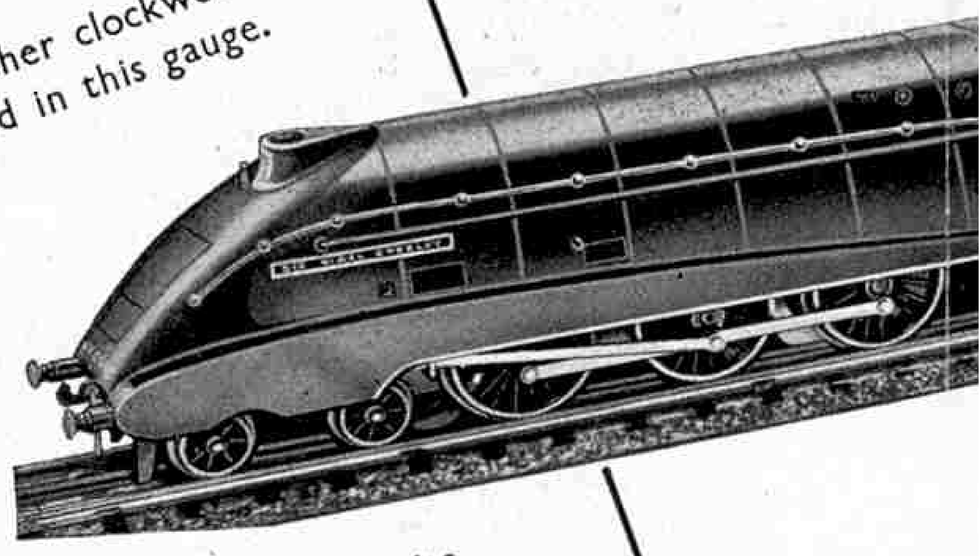
Built to Scale
Realistic Details—Positive Remote Control

The new Hornby-Dublo System, Gauge OO, marks a wonderful advance towards the ideal home railway. You can lay out a complete and realistic railway on your dining-table! The Trains are one seventy-sixth of the size of real trains.

Hornby-Dublo Locomotives are fitted with motors (either clockwork or electric) of a power and reliability never before achieved in this gauge. All the movements of the Electric Locomotives are perfect—starting, stopping, reversing and speed regulation are all carried out by the movement of one lever, and the control is positive.

Automatic couplings are fitted to all Coaches, Vans and Wagons. The Signals are realistic working models of the latest upper-quadrant type and the Buffer Stops have working heads.

Hornby-Dublo Electric Trains operate on **Direct Current** at 12 volts. This current may be obtained either from **Alternating Current Mains Supply** through a Dublo Transformer, or from a 12-volt accumulator. The Dublo Transformers are specially designed for these Trains, and no others should be used.



Write to Meccano Ltd., Dept. DF, Binns Road, Liverpool 13, for a free copy of the special folder giving details and prices of the complete Hornby-Dublo range.

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DUBLO TRANSFORMERS

Dublo Transformer No. 1 (Output 10 VA at 12 volts). For running one Hornby-Dublo Train. Price **9/6**

Dublo Transformer No. 2 (Output 20 VA at 12 volts). For running two Hornby-Dublo Trains on separate tracks by means of two No. 1 Dublo Controllers. Price **12/6**

DUBLO CONTROLLERS

No. 1. Fitted with single handle by which a train can be started, stopped, reversed and regulated for speed. A circuit breaker is incorporated. Price **21/–**

No. 1a. This controller, similar to No. 1 described above, is for use with 12-volt accumulators. Price **12/6**

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UBLO TRAINS

ECT TABLE RAILWAY

EDP1 Hornby-Dublo Electric Passenger Train. For details of complete Set, see below.

EDG7 Hornby-Dublo Electric Tank Goods Train. For details of complete Set, see below.

HORNBY-DUBLO EDP1 ELECTRIC AND DP1 CLOCKWORK PASSENGER TRAIN SETS

ELECTRIC

EDP1 Hornby-Dublo Electric Passenger Train Set, L.N.E.R. Contains EDL1 Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Automatic Reversing), Tender D1, Two-Coach Articulated Unit D2, Dublo Controller No. 1, seven EDA Curved Rails, one EDAT Curved Terminal Rail and two EDB Straight Rails. (To be operated from a Dublo Transformer, not included in Set.) Price **70/-**

Dublo Transformers are specially designed for these Trains; no others should be used.

Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:

EDPA1 Electric Passenger Train Set, L.N.E.R. (With Dublo Controller No. 1a.) Price **61/6**

CLOCKWORK

DP1 Clockwork Passenger Train Set, L.N.E.R. Contains DL1 Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Reversing), Tender D1, Two-Coach Articulated Unit D2, eight DA Curved Rails and two DB Straight Rails. Price **39/6**

HORNBY-DUBLO EDG7 ELECTRIC AND DG7 CLOCKWORK TANK GOODS TRAIN SETS

ELECTRIC

EDG7 Electric Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains EDL7 Six-coupled Tank Locomotive (Automatic Reversing), Open Goods Wagon D1, Goods Van D1, Goods Brake Van D1, Dublo Controller No. 1, seven EDA Curved Rails, one EDAT Curved Terminal Rail and two EDB Straight Rails. (To be operated from a Dublo Transformer, not included in Set.) Price **55/-**

Dublo Transformers are specially designed for these Trains; no others should be used.

Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:

EDGA7 Electric Tank Goods Train Set. (With Dublo Controller No. 1a.) Price **46/6**

CLOCKWORK

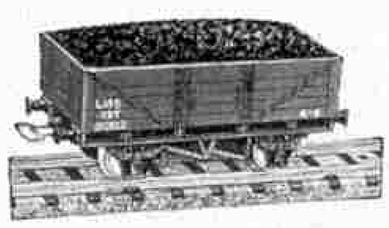
DG7 Clockwork Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains DL7 Six-coupled Tank Locomotive (Reversing), Open Goods Wagon D1, Goods Van D1, Goods Brake Van D1, eight DA Curved Rails, and two DB Straight Rails. Price **27/6**

New Hornby-Dublo Rolling Stock

OIL TANK WAGON "ROYAL DAYLIGHT" D1
Finished in bright red with gold lettering. Price **2/6**

PETROL TANK WAGON "ESSO" D1
Finished in buff with bright blue lettering. Price **2/6**

PETROL TANK WAGON "POWER ETHYL" D1
Finished in green with gold and red lettering. Price **2/6**



COAL WAGON D1
A standard Open Wagon with a realistic load of coal. Available lettered L.M.S., N.E., G.W. or S.R. Price **1/7**

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Care of Hornby-Dublo Trains

Oiling and Adjusting Working Parts

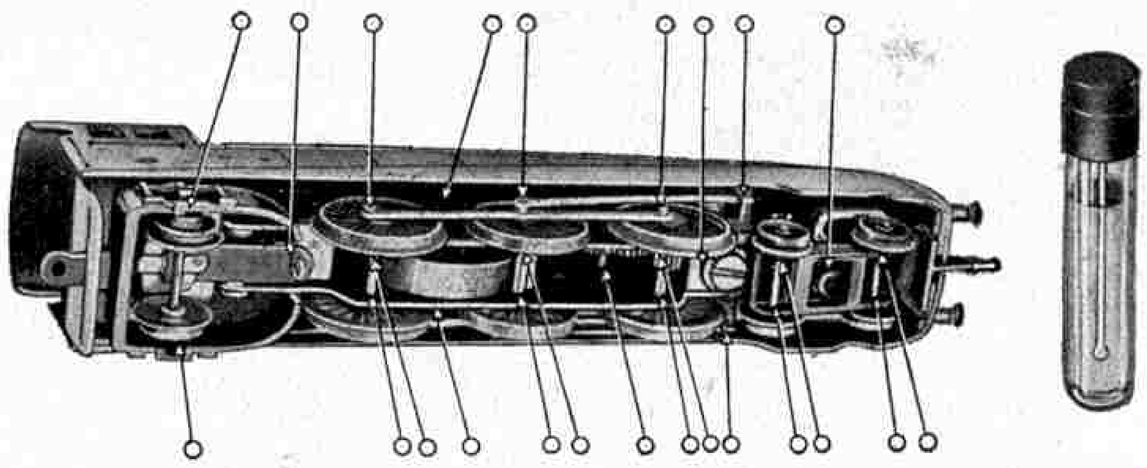
THE Hornby-Dublo System has very quickly established itself as a prime favourite with model railway enthusiasts. Its simplicity is one of its most outstanding and popular features, for there is nothing at all to go wrong with the track, and the only attention required by the rails and points is periodical cleaning to free the running surfaces from dust, or from oil that may accumulate owing to the continuous passage of wheels over them. This is best done by rubbing them gently with a dry clean cloth, which removes all trace of oil and restores the rails immediately to satisfactory running condition. An interesting practical note is that points should be wiped in a trailing direction, for the point blades may become bent through becoming caught in a cloth rubbed over them the opposite way.

It is always advisable to examine points from time to time in order to make certain that the blades fit snugly up against the stock rails, and when they are being operated the lever must be moved through the entire length of its travel and pressed hard against the base, both when opening and closing the points. Through the locking action of the lever mechanism this secures the switch blades firmly in position, so that it is impossible for them to move when a train is passing over them and to cause a derailment.

In the case of electric track care must be taken to ensure that during assembly the brass connector clips do not accidentally slip between the insulating material and the tinprinted base. This would cause a short circuit that could be a very troublesome affair, especially if the whole track had been assembled before the offending clip was discovered. The circuit breaker included in the Dublo Controller would prevent any damage, but the inconvenience would be annoying. Electrical connections should be made to the track by means of a Terminal Rail, and they should be made firmly so that there is good electrical contact.

It is important to see that the wiring from the Transformer to the Controller and thence to the track is in accordance with the instructions packed with these items. The details marked on the panels of the Transformer and Controller form useful guides.

It is surprising how many enthusiasts consider the oiling of a locomotive and train as of no importance. Some have been known to complain of their engines running badly when the trouble has been traceable only to lack of oil. When it is desired to give attention to the mechanism of one of the Hornby-Dublo Electric Locomotives, it is necessary to remove the housing, but this is a very simple process. All that is required is to remove the nut behind the buffer beam at the front of the engine underneath the frame with the aid of the special spanner that is provided with each locomotive for this purpose. When the nut is removed, the motor can be pulled away from the housing at the front end until the hole in the motor chassis casting is clear of the bolt holding it in position, and the next move is to slide the whole motor forward until it is entirely free of the housing. All parts of the motor are then accessible for the purpose of lubricatio , or for any minor adjustments that may be found necessary.

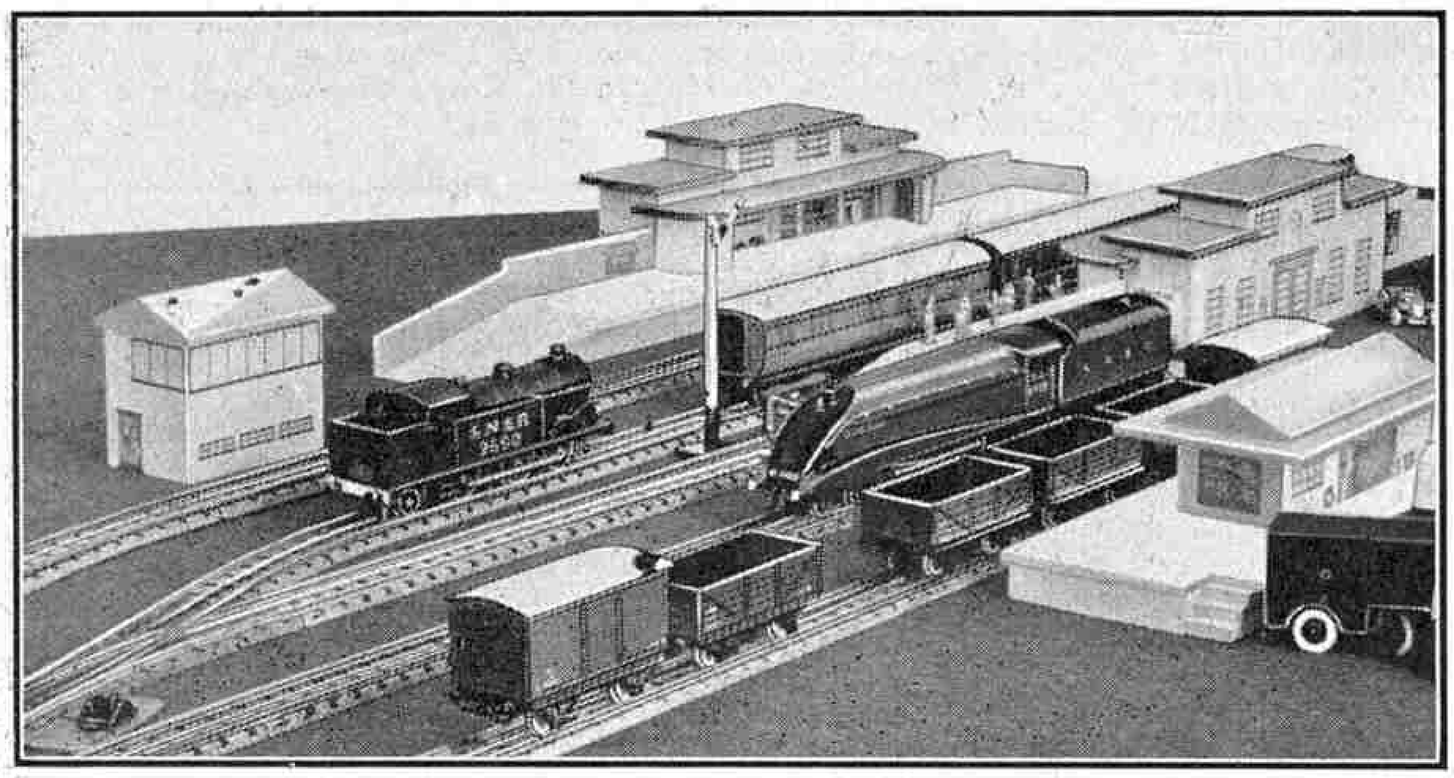


The circles in this underneath view of a Hornby-Dublo Clockwork Engine show where it should be oiled after about 10 hours' running time.

All moving parts should most definitely be lubricated, and with each locomotive is packed a special oiling chart for clockwork and electric engines. This has been prepared after careful experiments and testing, and should be obeyed to the letter. The chart for the DP1 Clockwork Locomotive "*Sir Nigel Gresley*" is illustrated on this page.

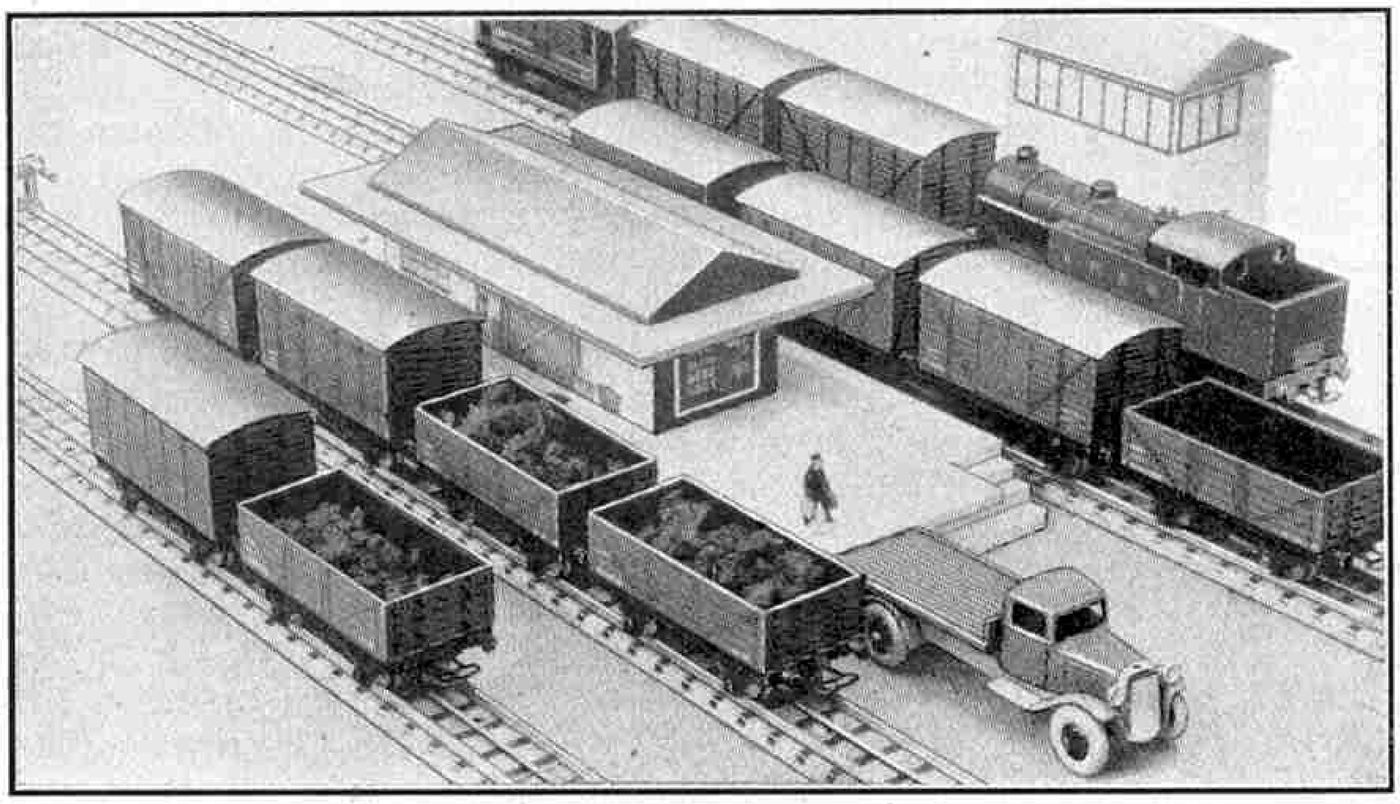
There are two parts of an electric mechanism that are not improved by the application of oil. These are the commutator and the brushes, both of which should be kept absolutely free from all traces of oil. The brushes are of the self-lubricating type that last for many months. The commutator should be kept scrupulously clean for continued good running. Sometimes it collects a deposit of carbon after long running, but this can be removed with the aid of a strip of fine emery paper, which must be about $\frac{1}{4}$ in. wide and should be pressed lightly on the face of the commutator while this is turned by slowly revolving the wheels of the engine in a forward direction.

A clockwork engine also requires



"Sir Nigel Gresley" ready to take over a train brought in from the sidings by the 0-6-2 tank engine.

lubrication, but it is not necessary to remove the mechanism for this purpose, as all oiling points can be reached easily. The only difference between a clockwork engine and an electric motor is that there are no parts in the former that should be kept entirely free from oil except the inside of the governor cup, which controls the speed of the motor and prevents it from "racing." This component is on the motor sideplate, and its effectiveness is reduced if its inner surface becomes oily. All other moving parts should receive a drop of oil to ensure their free running, and a bottle of oil of the correct grade for the engine is packed in each train set. The clockwork locomotives require D1 oil (red seal) while electric engines require D2 oil (blue seal).



A goods depot on a Hornby-Dublo layout. The lorry is waiting to be loaded with goods for distribution.

It is worth noting here that Hornby-Dublo electric engines operated from the mains require a short time to "get into their stride" after a period of inactivity. During this time, which usually is about a minute, the rectifier in the Controller is "warming up."

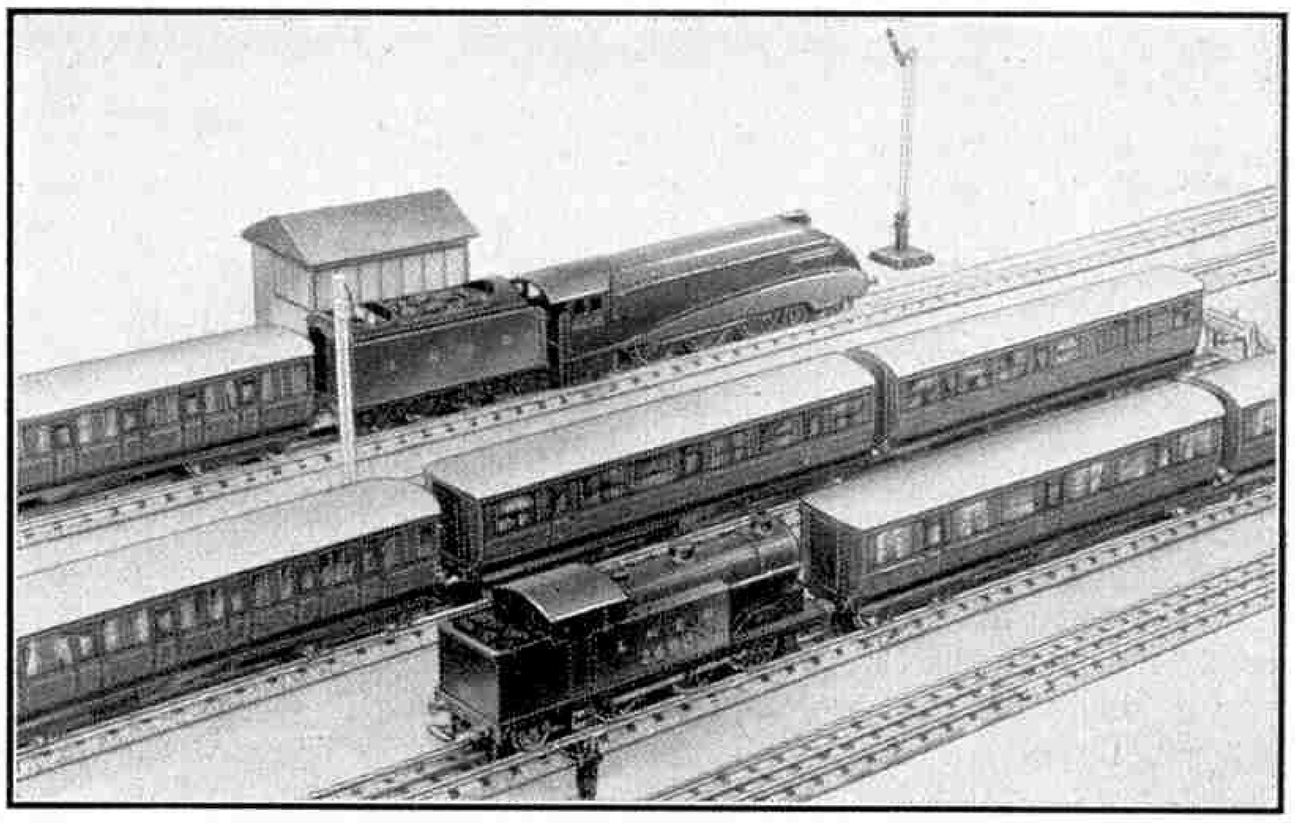
So much for the engines. The working parts of the coaches, wagons and vans also must be lubricated. This is a job that is often overlooked by model railway owners, but is just as important as the lubrication of the locomotives themselves in ensuring free running. The bogies of eight-wheeled vehicles that are not lubricated may be a little stiff and cause derailments, especially on reversed curves or when passing over points. All that is required is a drop of oil on each axle where the wheels fit on it, and a little attention to such details will be amply repaid by excellent and trouble-free results.

In the case of the Articulated Unit it is best to separate the two components. For this purpose the Unit is turned upside down and each of the two locking levers protruding through the floor near the articulating bogie is turned in a clockwise direction. The coaches are next moved toward one another and the bogie is removed. It is then a simple process to lift them apart and attend to each separately. When re-assembling the Unit care must be taken to place the metal Corridor Connection in the correct position first. The bogie is then replaced and the locking handles are moved in a counter-clockwise direction in order to secure it.

The actual quantity of oil to be applied is of importance, for too much can be as harmful as none at all. In the cork of the bottle packed with each set is a dip-stick for applying the oil to the engine and rolling stock. The use of an oil can is not advisable, as with it there is a tendency for the oil to "flood" the mechanism. The dip-stick collects just the right amount of oil, and this can be transferred to the parts requiring lubrication without the fear of any being spilled on parts that must be kept oil-free. Even then it is advisable after carrying out oiling operations to wipe all the wheel surfaces in order to make absolutely sure that no oil has found its way on to them.

The ingenious automatic couplings fitted to Hornby-Dublo locomotives and rolling stock are positive in their action, both on straight and curved track, provided that they are treated with a certain amount of care. They should be examined from time to time to see that they are perfectly aligned, for an accidental knock may bend one of them upward or downward. The design of the couplings allows them to be straightened out again without fear of breakage. A pair of pliers should be used for this work, but care must be taken not to flatten out the two prongs, one of which causes the vehicles to be hooked together, the other preventing the buffers from locking when the rolling stock is being pushed.

Model coaches look best when kept spick and span, and in this condition not only give the railway a good appearance generally, but enhance the reputation of the owner as a careful and enthusiastic miniature railway operator. It is not necessary to clean the locomotives and coaches and various items of goods rolling stock and other accessories on the layout every day, or even every week, but they should certainly receive attention at least once a month. Finger marks on the coaches and engine are unavoidable, but they can be removed quite easily by rubbing them over with a soft cloth that may be kept specially for the purpose. Coach and van roofs, especially those enamelled white, are liable to show up dust more quickly than other components, but this can be removed from them without trouble by wiping them with a damp cloth. These are jobs that do not take up a great amount of time, but are well worth while for the sake of the general appearance of a layout. Locomotive housings are most easily cleaned with a small soft brush.



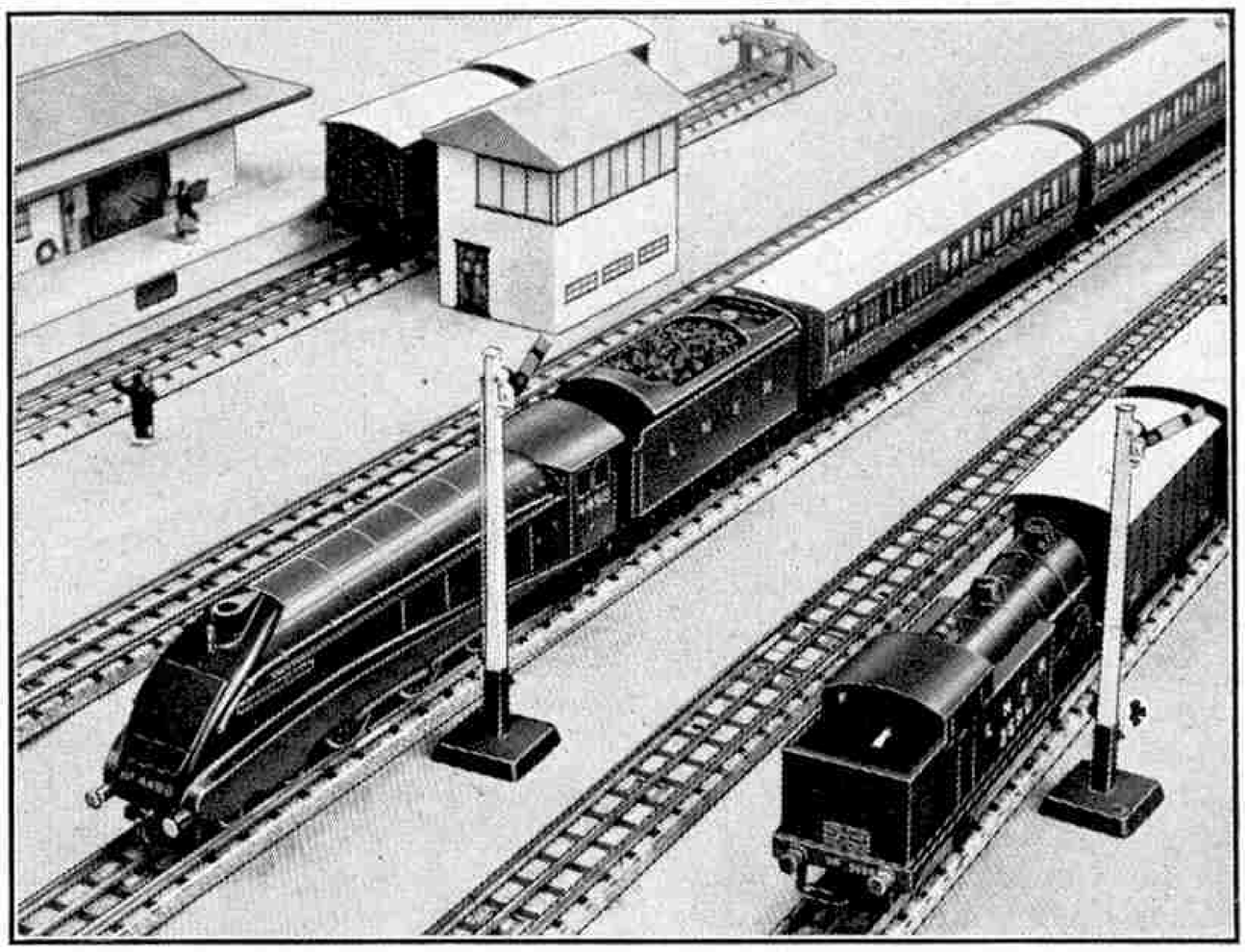
In the carriage sidings, where the coaches should be prepared for their next run.

Hornby-Dublo Mixed Traffic

Running Passenger and Goods Services

IN order to make the operation of a miniature railway as realistic as possible, it is necessary to work both passenger and goods trains. There is sometimes a tendency among many operators to concentrate their attention on one type of traffic only. For this practice there is no excuse on a Hornby-Dublo railway, as the variety of rolling stock and accessories available makes a well-balanced system of operations possible. This month therefore we are dealing with both passenger and goods train working in a general way, giving hints as to the realistic use of the various components.

Let us review first the Hornby-Dublo Passenger Locomotive and Train. As most model railway owners, and certainly all "*M.M.*" readers, are aware, the passenger train is handled by a magnificent model of the L.N.E.R. streamlined locomotive, No. 4498 "*Sir Nigel Gresley*," with corridor tender. It is the most perfect locomotive that has ever been produced in Gauge 00 and in its blue livery is a really thrilling sight. The real No. 4498 is famous as the hundredth Gresley "Pacific" to be placed in service on the L.N.E.R. It is the ideal express locomotive, and all the most important express duties on a Hornby-Dublo system should be performed by its splendid miniature, just as the real "A4" streamliners are the first choice on the L.N.E.R. to-day for both high-speed limited trains, and for the heavier but still fast trains.



An interesting scene on a Hornby-Dublo Railway, on which both Passenger and Goods Trains are operated, as suggested in the accompanying article.

The rolling stock available for operating with this locomotive consists of a Two-Coach Articulated Unit of the type that is used extensively by the L.N.E.R. in making up standard main line trains. The bodywork of these vehicles is really a marvel of tinprinting, as the graining that is such a feature of the varnished teak stock of the L.N.E.R. coaches is clearly reproduced. The two vehicles composing the Unit are of corridor type, one of the coaches having passenger accommodation only, and the other being a Brake Composite.

In addition to the latter Unit there is a separate First/Third Corridor Coach. It is similar in general design and construction to the coaches in the Articulated Unit, and is a most useful addition for making up an express passenger train. Actually on the L.N.E.R. a first/third corridor coach combined with a twin unit of the kind represented by these models forms the basis of many of the important main line trains.

Turning to goods trains, these are handled by a characteristic 0–6–2 Tank Locomotive, which is available in the colours of each of the four main line companies. The engines are of the same design, except that the G.W.R. model is fitted with a domeless boiler and correct type safety valve, features that are characteristic of G.W.R. locomotives.

These engines are excellent in appearance, as can be seen from the illustration on this page. A wealth of detail is included, even to such minute but nevertheless important items as boiler bands, washout plugs on the firebox, and the whistle in front of the cab. On a layout on which both passenger and goods trains are operated the Tank Locomotive can be used for passenger work when it is not employed on freight trains. For instance, it can be made to bring the coaches from the siding to the station to form a train; to add or detach any extra vehicles that may be required, or to carry out the disposal of a train at the end of a journey. It can in fact undertake in a most realistic manner all the duties that tank locomotives do in actual practice.

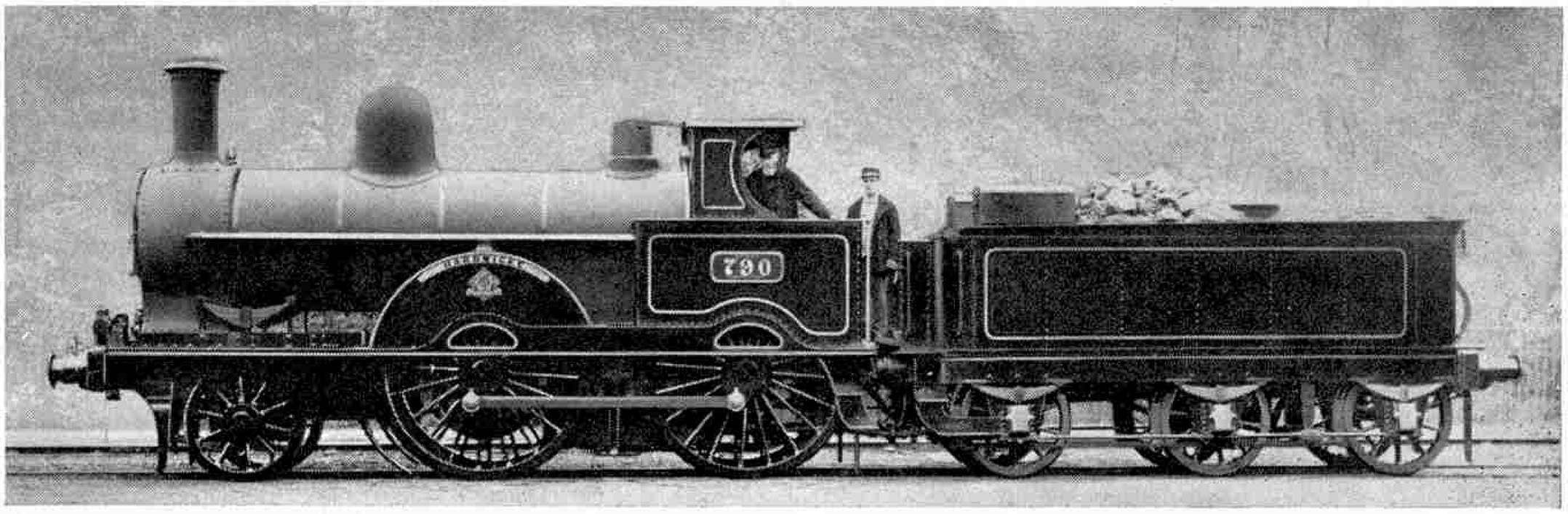
The rolling stock for making up goods trains represents the most up-to-date standard type of wagons and covered vans, all of which are lettered in the latest style agreed to by the four groups, in which the company's initials, the tonnage and the wagon number appear together in the left-hand corner of each wagon side. All these goods vehicles have tinplate bodywork mounted on pressure die-cast underframes that are full of detail. The Goods Brake Van is a particularly interesting model, as a separate van has been constructed for each company and each is a true-to-type design.

Enthusiasts who wish to operate combined goods and passenger services should see that their line is well supplied with accessories. For the passenger section there is the Main Line Station and Island Platform. They are constructed of wood, and will accommodate a three-coach train. The Goods Depot is of similar up-to-date form, and is a very pleasing addition to any Gauge 00 railway. Another accessory made of wood is the modern-style Signal Cabin. There are also the splendid upper quadrant type Signals, all excellent scale models and available with either "home" or "distant" semaphores.

Historic Locomotives

III. The London and North Western *"Hardwicke"*

By C. Hamilton Ellis



THE London and North Western engine *"Hardwicke"* was one of the "Precedent" or, more popularly, "Jumbo" class of 2–4–0 express locomotives, which for years performed some of the best work in the world over the English section of the West Coast Route. *"Hardwicke"* was built in 1892, and had 6 ft. 9 in. coupled wheels and cylinders 17 in. in diameter with a piston stroke of 24 in. The working pressure was 150 lb. per sq. in., and the engine alone weighed 32 tons 15 cwt. in working order. The tender, when full, added another 25 tons. The engine's number under the L.N.W.R. was 790.

"Hardwicke's" first notable appearance in the news was, curiously, a disreputable one, though not through a North Western fault. On 27th May 1892, when the engine was newly out of the shops, it was working the 2.10 p.m. Euston–Birmingham express. At the Midland junction, outside Birmingham, a Midland train over-ran its signals and collided sidelong with the North Western one. Both trains were on a bridge, and it was *"Hardwicke"* that went through the parapet and fell into a yard below. Driver and fireman stuck to their posts and went over with the engine, which was much damaged by the fall. Each of the crew lived to tell the tale, and the driver afterwards recalled how, as he clung to the left side of the cab, he saw the nose of the engine plunge down and the left-hand leading wheel strike the cobble-stones first!

It was in the "Race to Aberdeen" of 1895 that *"Hardwicke"* became suddenly famous. It took over the special West Coast racing train at Crewe, on the night of 22nd August. Driver Ben Robinson, a noted old-time stalwart, was at the regulator, and the load was one of three eight-wheeled coaches. From Crewe, Warrington was passed in 21 min. 55 sec. for the 24.1 miles, an average speed of 66 m.p.h. Warrington to Wigan, 11.5 miles, was covered at 67.9 m.p.h., and Wigan to Preston, 15.5 miles, at 68 m.p.h. Over the 20.6 miles between Preston and Lancaster, speed dropped to an average of 65.7 m.p.h., but over the short stretch of 6.5 miles between Lancaster and Carnforth it rose to 69.6 m.p.h. Carnforth is almost at sea level, and in the 31½ miles thence to Shap Summit the line rises to a height of 915 ft. This rise is not constant, for there are two "steps" over parts of which the gradient actually falls again, and the rises of course are steeper in consequence of these two breathing spaces.

Between Carnforth and Oxenholme, 12.8 miles, *"Hardwicke's"* speed averaged 67 m.p.h., and from Oxenholme to Tebay, 13.1 miles, with the long climb to Grayrigg, it was 61.2 m.p.h. After Tebay came the final big climb to the Summit, 5.8 miles, starting at 1 in 146 and stiffening to 1 in 75 for just over four miles. *"Hardwicke"* topped the bank in 6 min., or at an average of 58 m.p.h. Thereafter the train simply romped home with the gradient in its favour all the way to Carlisle. Shap Summit to Penrith, 13.3 miles, took 11 min., speed being 72.3 m.p.h., and the final 18 miles to Carlisle occupied 14½ min., average speed 74.4 m.p.h.

L.N.W.R. 2-4-0 "Hardwicke," with Driver Robinson and his fireman on the footplate. After a hard-worked career this notable engine is now preserved at Crewe Works. Photograph by courtesy of the L.M.S.

The average start-to-stop speed for the 141 miles between Crewe and Carlisle was thus 67.2 m.p.h., a record that remained unbeaten over this section until very recent years. The real beauty of the run lay in the maintenance of a very high average speed on the climb up from Carnforth, as opposed to a possible marked fall in speeds on the bank, and a nerve-racking toboggan ride down the other side.

Right into the nineteen-twenties, engines of this "Jumbo" type could be seen piloting the much heavier and more modern six-coupled engines on the West Coast expresses, or sometimes even working in pairs on these very heavy trains. For years *"Hardwicke"* did good work on North Western main line trains, and in quite recent times was a familiar sight on local traffic in the South Midlands. At grouping, the engine became L.M.S. No. 5031, retaining its name like most old North Western locomotives.

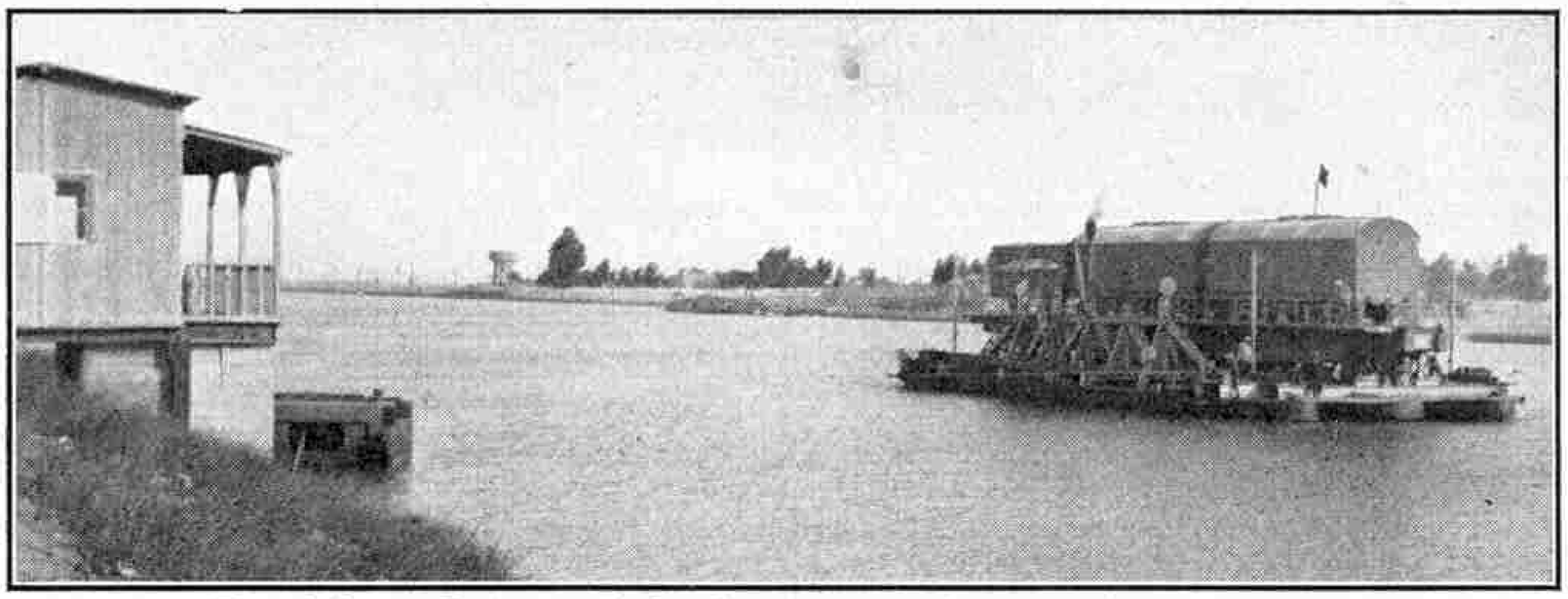
In the middle of 1931 *"Hardwicke"* was still at work, but since then it has been retired and is now preserved at Crewe, the birthplace of many notable engines.

FROM OUR READERS

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Train Ferry Across the Suez Canal

The train ferry shown in the illustration on this page is at Kantara on the Suez Canal. I happened to see the ferry "in action" when I was motoring along the bank of the canal, and took the opportunity of obtaining a photograph.



The train ferry at Kantara, on the Suez Canal. Photograph by R. C. Bush, Cairo, Egypt.

Kantara was of great importance during the Great War, when a military camp there stretched for more than five miles. Troops then crossed by a swing bridge, of which only the abutments now remain.

In ancient times Kantara was a great city of half a million people, and one authority gives it as the place where Moses and the Israelites pitched their tents before crossing the Red Sea. It certainly was the crossing place for caravans from Egypt to Syria, but to-day it is little more than a junction for the Palestine Railway.

R. C. Bush (Cairo).

Through St. Clements Caves

Not long ago I was one of a party conducted through the St. Clements Caves, Hastings. The caves, which are deep in the Ashdown Sands and have sandstone walls, are believed to have been caused by earth movements and probably were inhabited by human beings in prehistoric and mediæval ages. Early in the 19th century they were used by soldiers as a gambling den, which led to their being closed. Later they were opened, and balls and dances were held in some of the large chambers.

Special galleries have since been cut for ventilation purposes, the temperature always being at about 51 deg. The darkness and stillness were intense, particularly when all lights were put out and we stood still and held our breath.

M. C. Kelly (Welling).

The Carrick-a-Rede Rope Bridge

At the eastern extremity of the Giant's Causeway, Co. Antrim, a road sign announces that the tourist has arrived at Carrick-a-Rede, famous for its rope bridge. A hotel, general store and a few farmhouses are all that can be seen from the highroad, but after paying 4d. trespass-fee to the farmer-cum-storekeeper for the privilege of walking over his land to the edge of the cliff, a quarter-mile walk brings one to a stone gateway and a flight of steep steps leading down to the bridge.

The bridge connects the mainland with the island base of the salmon fishery, and is in use for six months of the year only, from March to September. It is approximately 100 yds. long and lurches somewhat sickeningly in the wind over a sheer drop of about 300 ft. The two steel cables are attached at each end to huge blocks of concrete sunk deeply in the rock, and from these are suspended loops of thick rope on which wooden planks are firmly lashed. Two ropes for use as handrails are attached to steel spikes driven into the concrete, and are connected to the cables at intervals by thin cordage.

The rope bridge at Carrick-a-Rede, in Co. Antrim. Photograph by R. Watson, Manchester.

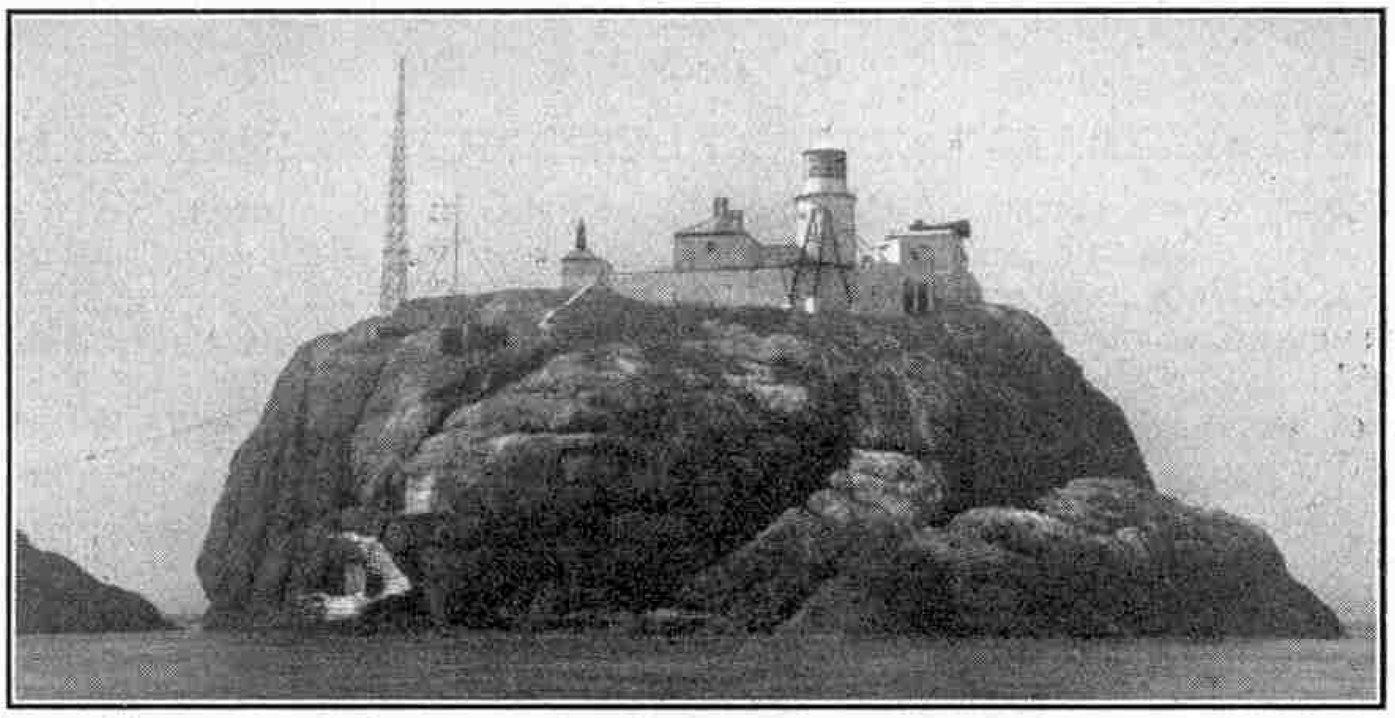
Fishermen cross the bridge with heavy loads of salmon on their backs, but tourists have been known, after the first few timid steps, to resort to their hands and knees and finish up in this undignified manner! It is, of course, impossible to turn back or for two people to pass, and unless one steps on the centre of each plank, the swaying sensation can be most unpleasant!

When the season is over, and the stormy winter approaches, the bridge is taken down. The wooden planks on their lashings are slid out of position, the cables being left standing.

R. Watson (Manchester).

The South Bishop Lighthouse

For rugged cliff and rock scenery the west coast of Pembrokeshire must be one of the finest places in England or Wales. The north promontory, St. Davids Head, has several islands and isolated rocks off the coast to enhance its charm. These islands are a menace to shipping in foggy weather, however, and particularly to cargo and fishing boats that pass between the mainland and Ramsey Island in order to shorten their journey. The South Bishop Lighthouse, on the most westerly of the islands, is a great help to these ships.



The South Bishop Lighthouse, off St. Davids Head, Pembrokeshire. Photograph by I. Sandars, Lincoln.

During a recent holiday I enjoyed an interesting sail to this lighthouse, which is about four miles from the mainland. As may be seen from the accompanying photograph, the foundation rock is very steep and landing is only possible in calm weather. The steps are cut out of the solid rock at the bottom, but near the top are made of concrete. Half way up is a concrete platform on which is mounted a small hand crane for raising supplies from the relief boat. In very rough weather this crane is too near the cliff edge to allow the boat to be unloaded safely. Unloading is then carried out by means of a telpher ropeway, one end of which is anchored to a rock opposite the island, the other passing over a gantry at the foot of the tower on to a winch. The supply boat is manœuvred between the two rocks until it is underneath the ropeway, where it may be unloaded more easily.

An interesting feature of this station is the beam wireless transmitter, which transmits the call sign automatically. The huge fog horns pointing north and west are blown by compressed air, pumped by two horizontal oil engines; these horns were blown most days during my holiday. They give four blasts each lasting $2\frac{1}{2}$ seconds once every $1\frac{1}{2}$ minutes.

One of the keepers also pointed out several trelliswork frames, which are suspended from the tower in Autumn, as a resting place for migrating birds attracted by the powerful light.

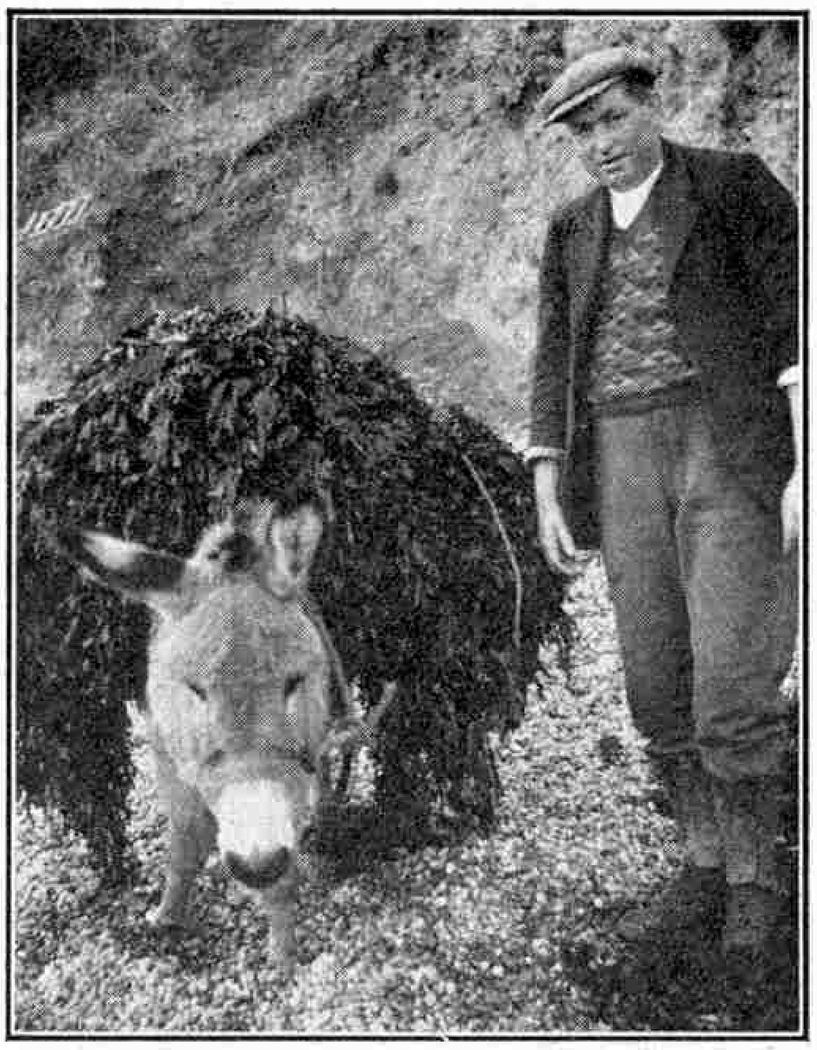
I. Sandars (Lincoln).

Pack-Horses in England

A number of pack-horse bridges survive in this country, but usually one sees pack ponies in use only in August, when they bring panniers loaded with grouse back from the moors. I was interested therefore to find recently a place on the East Devon coast where donkeys are used to carry seaweed from the shore up steep narrow paths to the cliff top. There they are later "packed" with the potatoes grown on the seaweed-fertilised land.

Despite many inquiries, I have found only one other place where pack-horses or donkeys are still used, and that is at Clovelly. Apparently the use of donkeys to carry sand at Trebarwith, and flour at Marsland Mouth, has ceased. It would be interesting to know if there are any other places in England where pack animals are still generally employed.

J. D. U. Ward (Oxford).



In East Devon donkeys are used to carry seaweed from the shore up the steep cliff. Photograph by J. D. U. Ward, Oxford.

The Bude Canal

Bude, a small North Cornwall town, has for several centuries past done much exporting and importing. In the early 19th century it was decided to build a canal, with wharves where boats could be accommodated instead of being merely run aground on the beach, as they had been previously. The canal was completed in 1826, and extended many miles inland, so that ships could sail direct to the inland wharves. In order to facilitate approach to the canal entrance a massive stone breakwater was built later. This did not save the Indiaman "*Bencooler*," which in 1862 was totally wrecked while trying to enter the harbour in a heavy storm. The crew of 29 were lost. The ship's figurehead was washed ashore and now stands in the churchyard.

Bude still imports many things, ranging from coal and slag to maize and wheat, while its main export has always been its excellent sand, which contains a high percentage of lime and is in great demand for artificial manures. The sand is found on the beaches, which rise up into high dunes. Originally, a small horse railway was provided to take the sand from the dunes up to the wharves, and this is still used, although heavy lorries now do most of the work. The sand trade is of great importance, and has been carried on since the time of Richard III.

The canal's trade ran smoothly until in the nineties the railway came. A line was built from the town station to the canal wharves at Bude, and this took most of the inland transport hitherto undertaken by the canal craft. With the decreasing use the canal beyond the Bude wharves suffered from lack of maintenance, and past Rodd's Bridge, about a mile-and-a-half up the canal, it became a boggy reed-bed. The remaining part of the canal is now used for little more than pleasure boating, since cargo boats never penetrate further than Bude, a few hundred yards from the sea. Admission from the sea to the canal is by means of a lock. B. N. Cole (Birmingham).

Mechanisms for Model Motor Cars

Meccano Clutches, Gear-Boxes and Differentials

By "Lock-Nut"

LAST month I described several types of steering mechanism suitable for Meccano model motor vehicles, and many model-builders have written to tell me that they found the suggestions outlined very helpful in building vehicles of all kinds. This month I am dealing with the arrangement of the various mechanisms by which the power of the driving motor is transmitted to the wheels.

Generally speaking, the transmission system of a car comprises three essential units. The first of these is the clutch, which serves the purpose of coupling the power unit to the gear-box that forms the second unit. Thirdly, there is the differential gear that transmits the final drive from the gear-box to the road wheels.

With the usual forms of clutch the drive is transmitted by bringing two surfaces into contact so that friction causes them to grip each other. The mechanism is placed between the engine crankshaft and the gear-box, so that the two can be disconnected to allow the driver of a car to change gear, and to stop his vehicle without stopping the engine.

One of the most simple types of clutch to reproduce in Meccano is shown in model form in Fig. 4 in which a Rubber Ring on Pulley 1 and the Flanged Wheel 3 are the two members that are engaged. The Pulley 1 fitted with the Rubber Ring is fitted on Rod 2 which represents the driving shaft. The Flanged Wheel rotates with Rod 4, the end of which is separated by a slight interval from that of Rod 2, and yet is free to slide along it. This is effected by means of two Angle Brackets, which are fixed to the Flanged Wheel but are spaced from it by Collars. The slotted holes of the Angle Brackets are occupied by the bolts that fasten Collar 5 to Rod 4. The Flanged Wheel 3 is held in engagement with the Ring on Pulley 1 by a portion of a Compression Spring 6, which is inserted in the position shown.

The withdrawal mechanism of this clutch may consist of suitable arms or "claws" resting on the flange of the Wheel 3 and engaging its rim, so that with the operation of a convenient hand or foot lever, the Wheel 3 can be forced back against the spring.

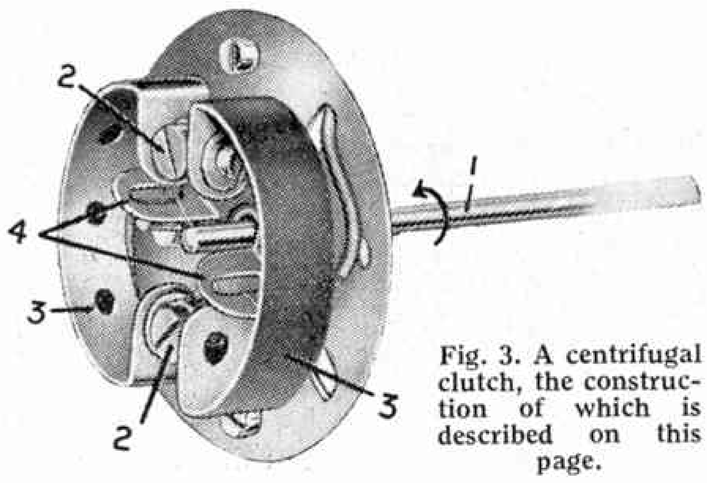


Fig. 3. A centrifugal clutch, the construction of which is described on this page.

A simple type of clutch can also be made in the following manner. A Bush Wheel free on the gear-box shaft is pressed against a 1" Pulley fitted with a Rubber Tyre by a Compression Spring. The Bush Wheel is rotated with its shaft by means of Flat Brackets fixed to a Collar, the Flat Brackets engaging with set screws held in the tapped holes of the Bush Wheel by lock-nuts. This unit acts only as a slip clutch, and when another gear is engaged in the gear-box the clutch slips and allows for the difference in speeds of the driving motor and gear-box shafts.

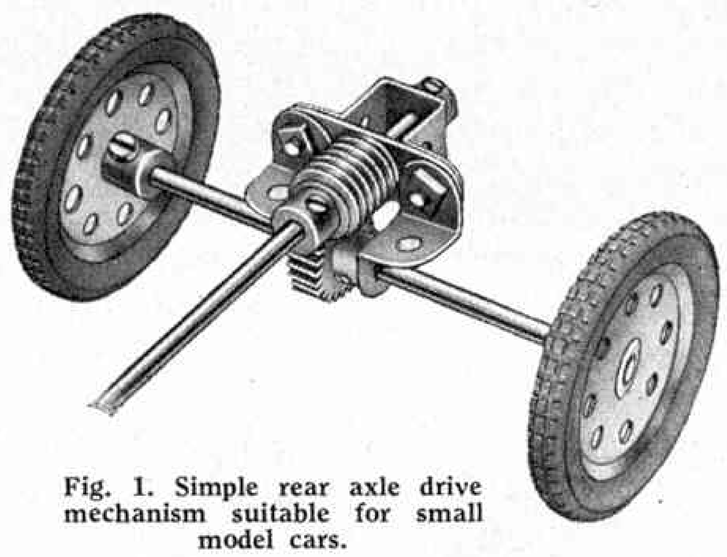


Fig. 1. Simple rear axle drive mechanism suitable for small model cars.

This arrangement can be adapted for operation by a foot pedal. For this purpose the 1" Pulley is replaced by a $\frac{3}{4}$" Flanged Wheel, inside the rim of which a circle of indiarubber is pressed. The withdrawal fork consists of two Pawls without bosses, which are locked on a Screwed Rod so that they can force the Bush Wheel back against the pressure of the Compression Spring.

A more compact type of clutch is the plate type, a model of which is shown in Fig. 2. This has what is known as a floating plate between the driving and driven members, and its operation is similar to that of the multi-plate clutches employed in certain modern cars.

The plate is represented by a $\frac{1}{2}$" loose Pulley fitted with an Aeroplane Constructor Rubber Tyre, and is free to rotate on the driven shaft. The Bevel Gear is free on its Rod, but is retained in position by Collar 3. The Gear is driven from the power unit of the model. The $\frac{3}{4}$" Flanged Wheel is gripped in a Socket Coupling but is free on the Rod. Collar 2 is arranged so that its grub screw engages with the slot in the Socket Coupling and thus turns it bodily with the Rod. The withdrawal mechanism consists of a fork that engages in the neck of the Socket Coupling, and it is built by fixing two 1" Screwed Rods in the end tapped bores of a Coupling, the latter being fixed on a shaft to which a suitable foot pedal is attached.

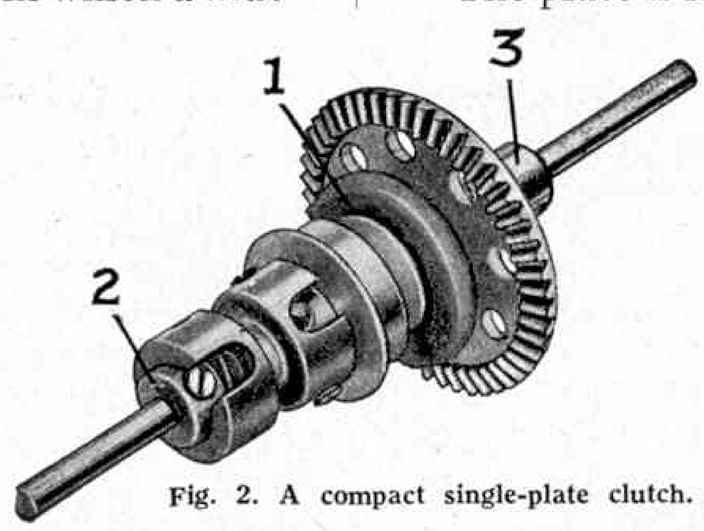


Fig. 2. A compact single-plate clutch.

A very interesting special type of clutch is shown in Fig. 3. In this the clutch members, which resemble the shoes of an internal expanding brake, are kept in engagement by centrifugal force, and the clutch is controlled by altering the engine speed. Rod 1 is driven by the engine in the direction indicated by the arrow, and it carries a Face Plate. The Pivot Bolts 2 each carry a Collar and three Washers, the shoes 3 of the clutch being fixed to the Collars. The shoes are held lightly together by short pieces of Spring Cord, but move outward when the shaft 1 is rotating, and are then

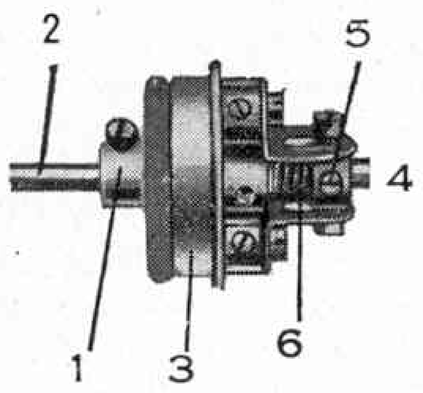


Fig. 4. A simple friction clutch.

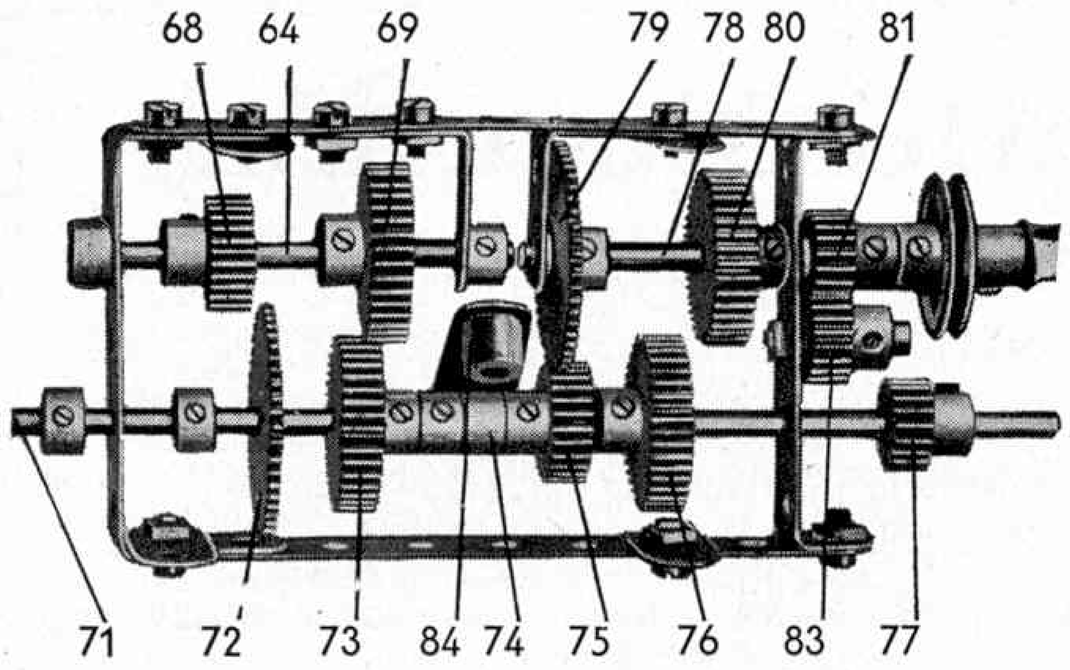


Fig. 5. This gear-box provides three forward speeds and a reverse movement.

forced into contact with the rim of a Boiler End fixed to the gear-box shaft. A free-wheel is incorporated in order to prevent the car from over-running the engine. This consists of two Angle Brackets 4, which are held in contact with a $\frac{1}{2}''$ Pinion on the driven shaft by Spring Cord.

No matter how small a model motor car is, a gear-box of some kind is necessary to make it realistic and interesting. The easiest type to build is one giving a single speed forward and one in reverse. This can be made by fixing a Contrate Wheel on the driving shaft of the Motor, and arranging a sliding Rod fitted with two Pinions so that moving it backward and forward allows either of the Pinions to be meshed with the Contrate Wheel.

Fig. 7 shows a gear-box that provides three speeds forward and one reverse, and is of particular interest on account of its extreme compactness. The end of the Rod 1 is inserted in the bore of the $\frac{1}{2}''$ Pinion 4 carried on a separate Rod 2, from which the final drive is taken. The Rod 2 also carries a $\frac{3}{4}''$ Pinion and Collar. The sliding layshaft is a $4\frac{1}{2}''$ Rod, on which are a $\frac{1}{2}''$ Pinion 5, a $\frac{3}{4}''$ Pinion 6, and a $\frac{1}{2}''$ Pinion 7. A $\frac{1}{2}''$ Pinion 8 is carried on a $\frac{3}{4}''$ Bolt screwed into the transverse bore of a Threaded Boss and locked by means of a grub screw into the opposite end of the bore. The Threaded Boss is rigidly attached to the gear-box frame by a $\frac{1}{2}''$ Bolt 9, but is spaced by a Collar and two Washers.

The movement of the sliding shaft is controlled by a $\frac{3}{8}''$ Bolt 10, the head of which fits between the bosses of the Pinions 6 and 7. The Bolt is fixed in a Collar on the end of a 3″ Rod forming the gear change lever, which is pivoted to a 1″ Triangular Plate by a further Collar secured in place on the Rod by its grub screw. The latter Collar carries a bolt, the shank of which passes through one of the holes in the Triangular Plate. The Bolt is locked in position by a nut to allow the Rod to pivot freely. The first forward speed is shown in engagement in the illustration, the drive passing through the $\frac{1}{2}''$ Pinion on the driving shaft 1 to the $\frac{3}{4}''$ Pinion 6 on the layshaft. The $\frac{1}{2}''$ Pinion 7 is engaged with the $\frac{3}{4}''$ Pinion on the driven shaft, so that there are two stages of reduction gearing between driving and driven Rods. By sliding the layshaft to the right the Pinion 7 is disengaged, but Pinion 6 remains in engagement with its $\frac{1}{2}''$ Pinion and at the same time is brought into mesh with Pinion 4. This gives a straight through drive.

Further movement of the sliding Rod brings into engagement Pinions 3 and 5 and 6 and 4, thus providing two step-up stages for top gear. Reverse gear is obtained when the rod is slid over to the extreme left, for the drive then goes through Pinions 3 and 8, which are in constant mesh, to Pinion 6, Pinion 7 engaging the $\frac{3}{4}''$ Pinion.

The gear-box shown in Fig. 5 gives the same number of forward speeds as the gear-box just described, but it is more bulky and provides a wider range of gear ratios. It is suitable for incorporation in large models of heavy construction where a wide choice of gear-ratios is an advantage. The operation is exactly the same as the small gear-box shown in Fig. 7.

Gear changing is effected by Crank 84, which is pivotally attached by its slotted hole to Collar 74 and forms the selector arm. Its boss should be fixed on a Rod placed across the chassis of the model in which it is incorporated. A suitable gear lever can then be fixed to the Rod.

The final drive from the gear-box can be transmitted to the rear axle in several ways. A simple arrangement such as a $\frac{1}{2}''$ Pinion driving a Contrate Wheel fixed to the rear axle or any other system of gears producing a right angle drive can be used, and in small models arrangements of this kind are entirely satisfactory. Another useful type of rear axle drive is illustrated in Fig. 1, and is of particular interest because the worm drive gives a fairly large reduction ratio. Its construction is easy to follow from the illustration, and either a $\frac{3}{4}''$ or a $\frac{1}{2}''$ Pinion may be used in conjunction with the Worm.

An alternative construction is to connect two $1\frac{1}{4}''$ Discs by means of $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, and to journal the driving shaft, to which the Worm is fixed, in the centre holes of the latter parts. The rear axle is journalled in the $1\frac{1}{4}''$ Discs and is fitted with a $\frac{1}{2}''$ Pinion.

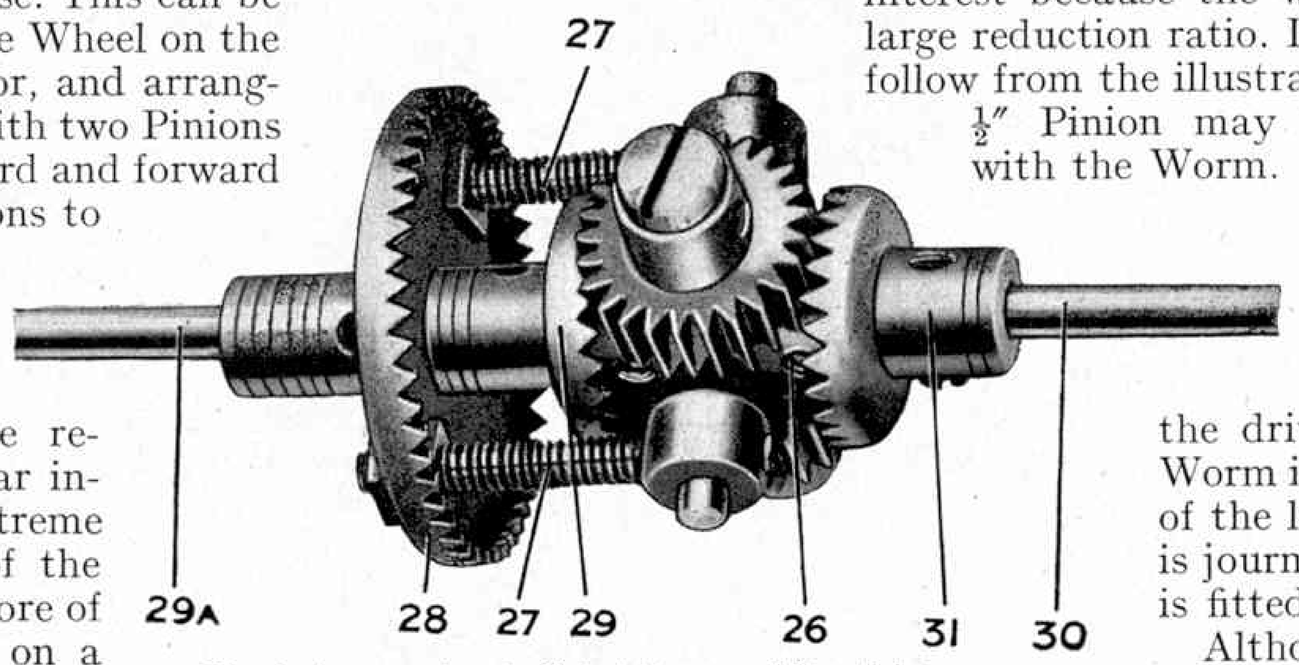


Fig. 6. A compact and efficient Meccano differential gear.

Although devices of this kind are satisfactory for some model-building purposes, in actual practice a solid axle is never used except on certain types of light cars. The reason for this is that when a car is turning in a circle the inner wheel tends to move more slowly than the outer wheel because it travels through a shorter arc. With the two fixed to the axle one of them therefore would drag or skid when turning. In order to allow each of the rear wheels to rotate at different speeds and still transmit the drive when a car is turning corners, it is necessary to introduce a special type of gearing in the rear axle, which is built in two parts. This gearing is the differential. A Meccano differential gear of compact design suitable for inclusion in model cars of all types is shown in Fig. 6. It should be enclosed in a casing consisting of Boiler Ends joined by 2″ Strips.

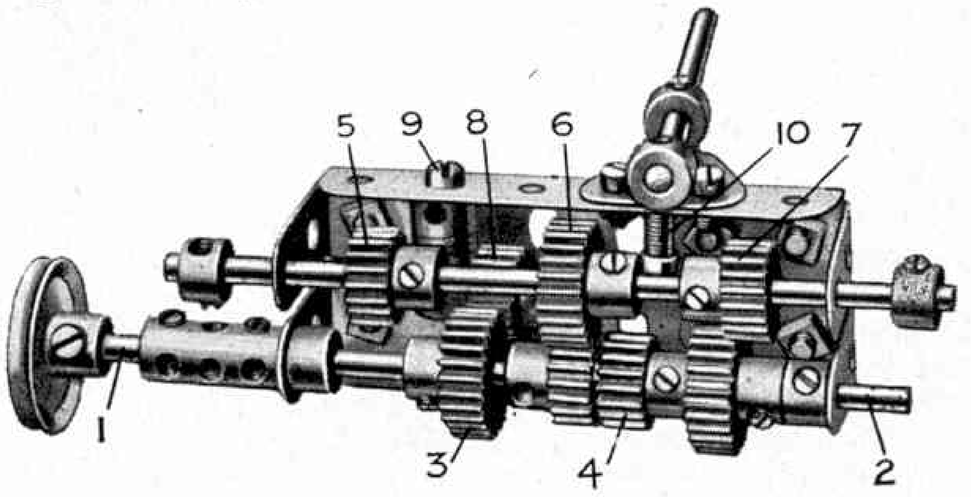


Fig. 7. One of the smallest three-speed and reverse gear-boxes yet constructed from Meccano parts.

Meccano Suggestions Section

By "Spanner"

(432) Slave Clock (E. Siniscalco, Buenos Aires, Argentine)

Model clock construction is one of the most fascinating branches of Meccano model-building, whether weight-driven or electric mechanisms are employed. A particularly interesting branch is concerned with master and slave clocks, and a novel clock of the last named type is shown in Figs. 432 and 432a. It is the work of E. Siniscalco, Buenos Aires, Argentine, who was awarded First Prize for it in the "Suggestions" Model-Building Contest. Instead of an ordinary dial and hands, this clock has rotating discs with numbered edges, and these are moved at the end of every minute by an Electric Motor controlled by a master clock.

The mechanism is built up on the side plates of an E6 or E20B Electric Motor. Two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates are fixed by Angle Girders to the Motor in the positions shown, and are connected by a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. A Worm fixed to the armature shaft of the Motor is in mesh with a $\frac{1}{2}''$ Pinion fixed to the 3" Rod 1, which carries at its other end a second $\frac{1}{2}''$ Pinion. The latter Pinion in turn is geared to a $2\frac{1}{2}''$ Gear Wheel 2, fixed on a $2\frac{1}{2}''$ Rod, which carries also a $\frac{1}{2}''$ Pinion meshing with 57-teeth Gear 3. A Worm on the same shaft as Gear 3 drives a fourth $\frac{1}{2}''$ Pinion that is fixed to the $6\frac{1}{2}''$ Rod 4. This Rod carries also a 2" Sprocket Wheel and a metal disc 5 bolted to a Bush Wheel.

The disc has 10 slots cut in its circumference, the slots being of sufficient width to accommodate a Meccano Rod. An Elektron Magnet Coil 6 is clamped between $1\frac{1}{2}''$ Strips by 2" Screwed Rods, which in turn are lock-nutted to a support consisting of two Simple Bell Cranks and two $3\frac{1}{2}''$ Strips. Next to these Strips is bolted a 2" Slotted Strip, and a $4\frac{1}{2}''$ Strip is fixed in a similar position on the other side plate. This Strip carries a Handrail Support, to which is pivoted a Small Fork Piece 7 bearing a $2\frac{1}{2}''$ Rod in its boss. Fork Piece 7 is fitted with an Angle Bracket and a Pendulum Connection as shown, the latter forming a brush that makes contact with the insulated Silver Tipped Contact Screw 8. As sparking may occur between Fork Piece 7 and the Rod on which it is pivoted when the device is in operation, it is necessary to connect the brush to the Handrail Support by wire 9. The Magnet Coil Core is gripped in a Swivel Bearing, the spider of which is fixed to the $2\frac{1}{2}''$ Rod as shown.

The wiring can now be carried out. The Contact Screw 8 is connected to the right-hand Terminal 17 on the base to which the Motor is bolted, while the left-hand Terminal 17 is connected to one terminal of the Electric Motor. The other Motor terminal is earthed to the frame of the model. The Terminals 17 are connected to the terminals of a suitable Transformer, and the wires 16 through which the controlling impulse passes to the clock, are connected to the Magnet Coil 6.

The frame supporting the numbered hour and minute discs should now be fitted. The Hub Discs are carried on 2" Rods, and the Disc on Rod 11 carries a Threaded Pin 12 that engages with the spider 13 on a $1\frac{1}{2}''$ Rod. This Rod is geared through two $\frac{1}{2}''$ Pinions and a 57-teeth Gear 14 to the Rod carrying the second Hub Disc. The latter carries two Threaded Pins arranged diametrically opposite each other, and these operate a similar spider mechanism to that just described. The Pulley 15 and a similar part on the central Disc shaft form the drums of band brakes, which prevent the Discs turning on their own. The Discs should be fitted with numbered strips. The first strip is numbered 1 to 0; the central strip is numbered 0 to 5—0 to 5; and the last strip is numbered 1 to 12.

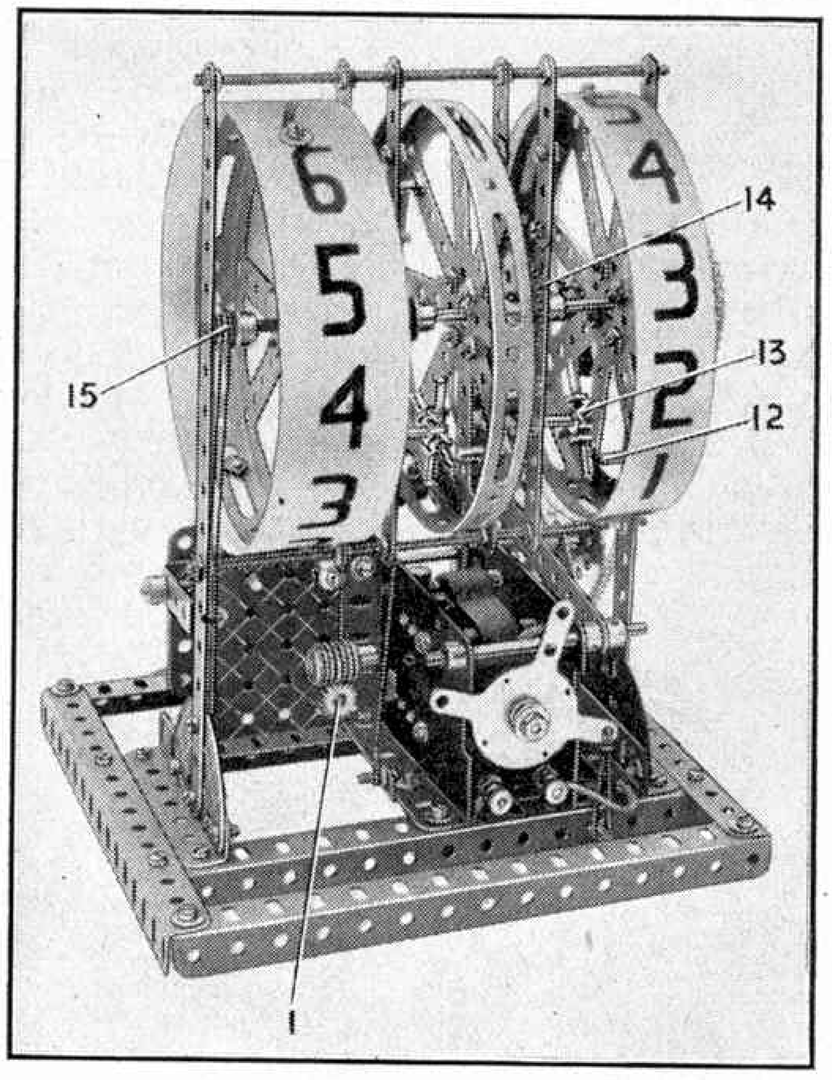


Fig. 432

This mechanism works simply but effectively. When an impulse is sent from the master clock through wires 16 and the Magnet Coil 6, the Magnet Core is pulled upward and raises the $2\frac{1}{2}''$ Rod clear of its slot in the disc 5. The brush then makes contact with Screw 8 and sets the Motor in operation, thus causing the disc to rotate. Meanwhile the current is cut off from Coil 6 and the $2\frac{1}{2}''$ Rod rests on the circumference of the disc so that it falls when the next slot is brought under it, the circuit to the Motor thus being broken. The mechanism is then ready for the next impulse, which is sent out from the master clock at intervals of one minute. In order to stop the armature of the Motor from rotating after the circuit has been broken the Bell Crank 10, which forms a brake shoe, is arranged to engage with the rim of a $1\frac{1}{2}''$ Pulley on the armature shaft.

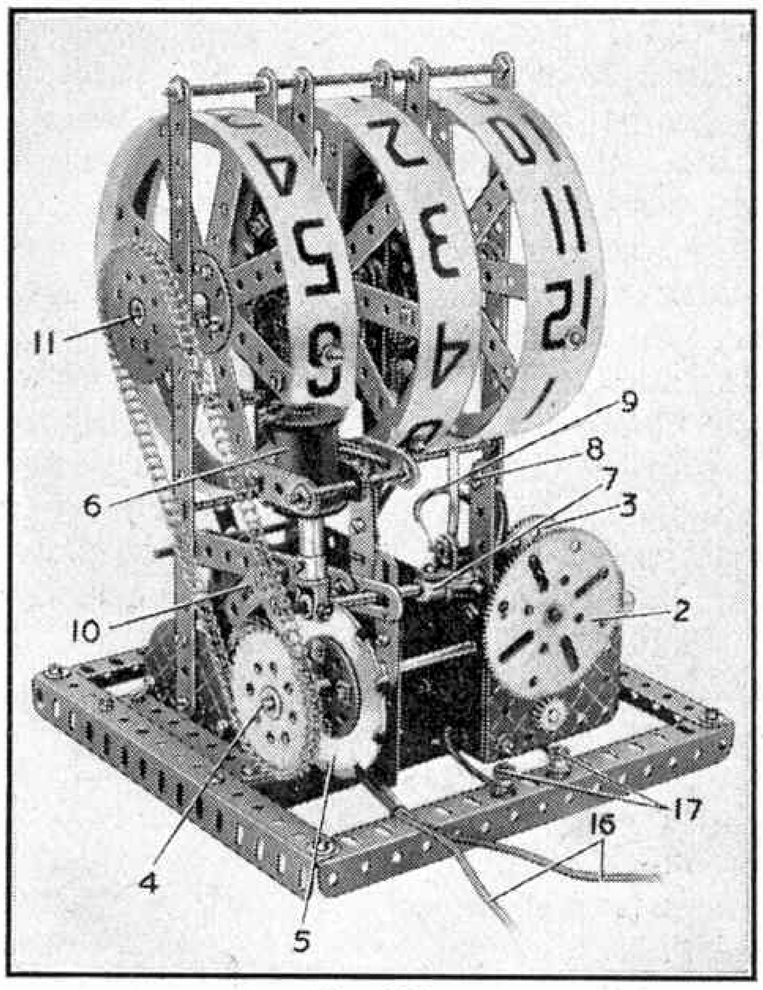


Fig. 432a

(433) Rubber Powered Chassis

(H. Clarke, Chester)

Novel methods of driving Meccano models that have been suggested in the past have included the use of gramophone turntables and momentum drives, the latter for mobile models. These have proved successful in certain cases, but both have limitations. For example, a momentum drive is only suitable for light models, and a gramophone turntable can be used as a source of power only for models of the stationary type. The unusual driving unit illustrated in Fig. 433 will be found useful for operating both small model vehicles and certain types of stationary machines. It is a geared rubber motor suggested by H. Clarke, Chester, and is interesting, although it is limited in application and cannot be regarded as in any way a substitute for a Clockwork or Electric Motor.

The motor is incorporated in a chassis built up of two $12\frac{1}{2}''$ Angle Girders connected at their ends by $4\frac{1}{2}''$ Angle Girders. A further $4\frac{1}{2}''$ Angle Girder bolted near the rear of the chassis supports a $3\frac{1}{2}''$ Flat Girder. This Flat Girder and the rear Girder of the chassis provide bearings for the three Rods carrying the Gears. Rod 1 and the Rod in a similar position on the other side of Rod 2 each carry a 50-teeth Gear and a Large Fork Piece. Rod 2 carries a $\frac{3}{4}''$ Pinion and a $\frac{1}{2}''$ Helical Gear. The latter part in turn meshes with a $1\frac{1}{2}''$ Helical Gear fixed to the rear axle of the model.

Each of the twin rubber motors consists of three 20" Driving Bands, and they are anchored to the front of the chassis by Double Brackets and $1\frac{1}{2}''$ Rods. The Bands are connected to the Large Fork Pieces by Pivot Bolts. The motors are wound up by means of the hand wheel and the model travels at surprising speed when it is set on the ground and released.

It would be great fun for several model-builders to arrange races between small racing cars powered in this manner, using different numbers of Driving Bands in each motor.

(434) A Meccano Time Switch

(T. Tasker, Barnsley)

As most model-builders know, electric lights in shop windows and street lamps are switched off by a time switch that operates automatically at a pre-set time. The device usually includes a clockwork time mechanism that operates a switch, but in the Meccano mechanism shown here an ordinary alarm clock operating a simple form of trigger mechanism is used. The trigger mechanism is constructed entirely from standard Meccano parts and is connected to the ordinary light switch by a length of Sprocket Chain, Cord or Wire Line.

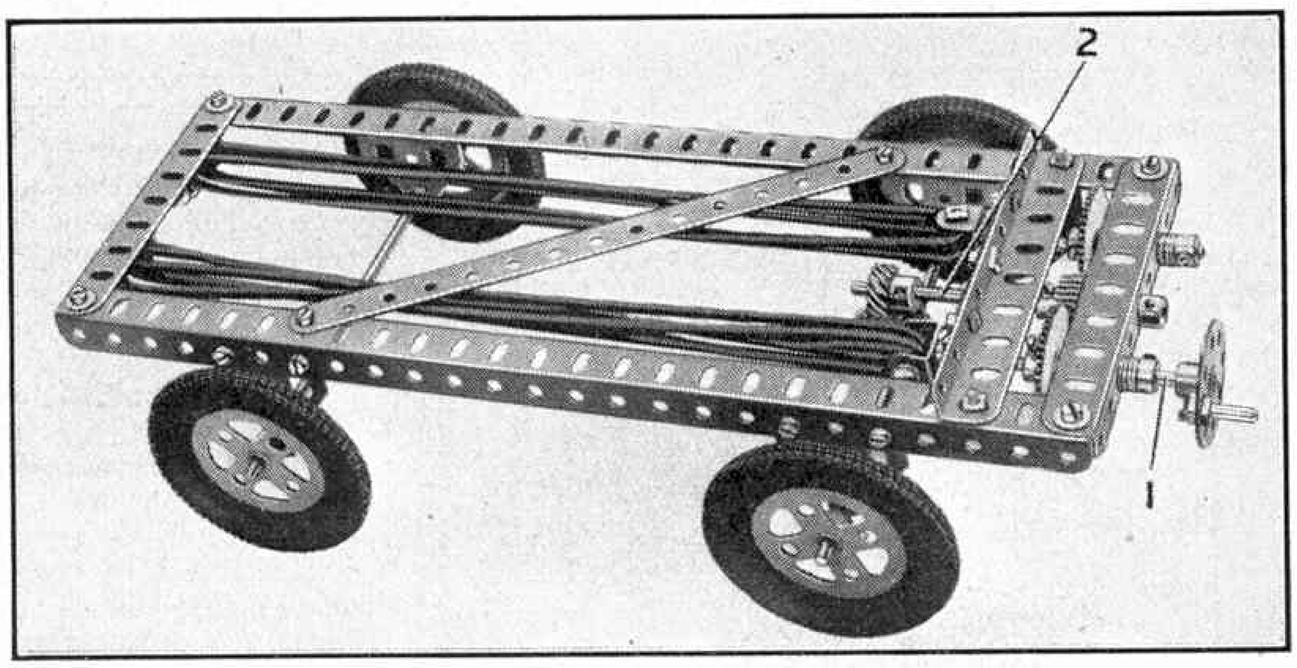


Fig. 433

The 7½″ Angle Girders 1 are secured to the 5½″×2½″ Flanged Plate forming the base of the device. The member 2, which slides on the flanges of the Girders 1, consists of two 3½″ Flat Girders, which are placed face to face and spaced apart by Washers on the securing bolts. Two tension Springs (Part No. 43) are attached to the sliding member 2 and also to a 3½″ Strip that is bolted between the Girders 1.

A Rod 5, journalled in 1½″ Strips that are bolted to the 7½″ Angle Girders, has secured to it two Couplings carrying the Rods 3. The Couplings are spaced on the Rod 5 so that Rods 3 may pass freely through the slotted holes of two Angle Brackets that are secured to the sliding frame 2. The Rod 5 is allowed a little side-play in its bearings, however, and when the mechanism is being set this Rod is moved slightly to one side and the frame 2 is raised so that the Rods 3 press against the Brackets, as indicated in the illustration, and thus support the frame 2.

The left-hand Coupling has a ½″ Bolt inserted in its transverse bore for the purpose of engaging with the alarm key 4 of the clock. Both the winding and alarm keys of the clock depicted in the illustration are somewhat unusual in shape. They are of sheet metal bent into a U-section, but if an ordinary flat key is fitted, it may be used just as easily.

When the alarm is released, the key rotates in an anti-clockwise direction and strikes the ½″ Bolt, thus forcing the Rod 5 to the right and causing the ends of the Rods 3 to move into the slotted holes of the ½″×½″ Angle Brackets. This action allows the sliding member to be drawn downward by the Springs, and the switch is pulled "off" through the medium of a length of Sprocket Chain that is attached to the member 2 and also to the switch. If the key turns in the clockwise direction when the alarm is given, the Rod 5 must be moved to the right.

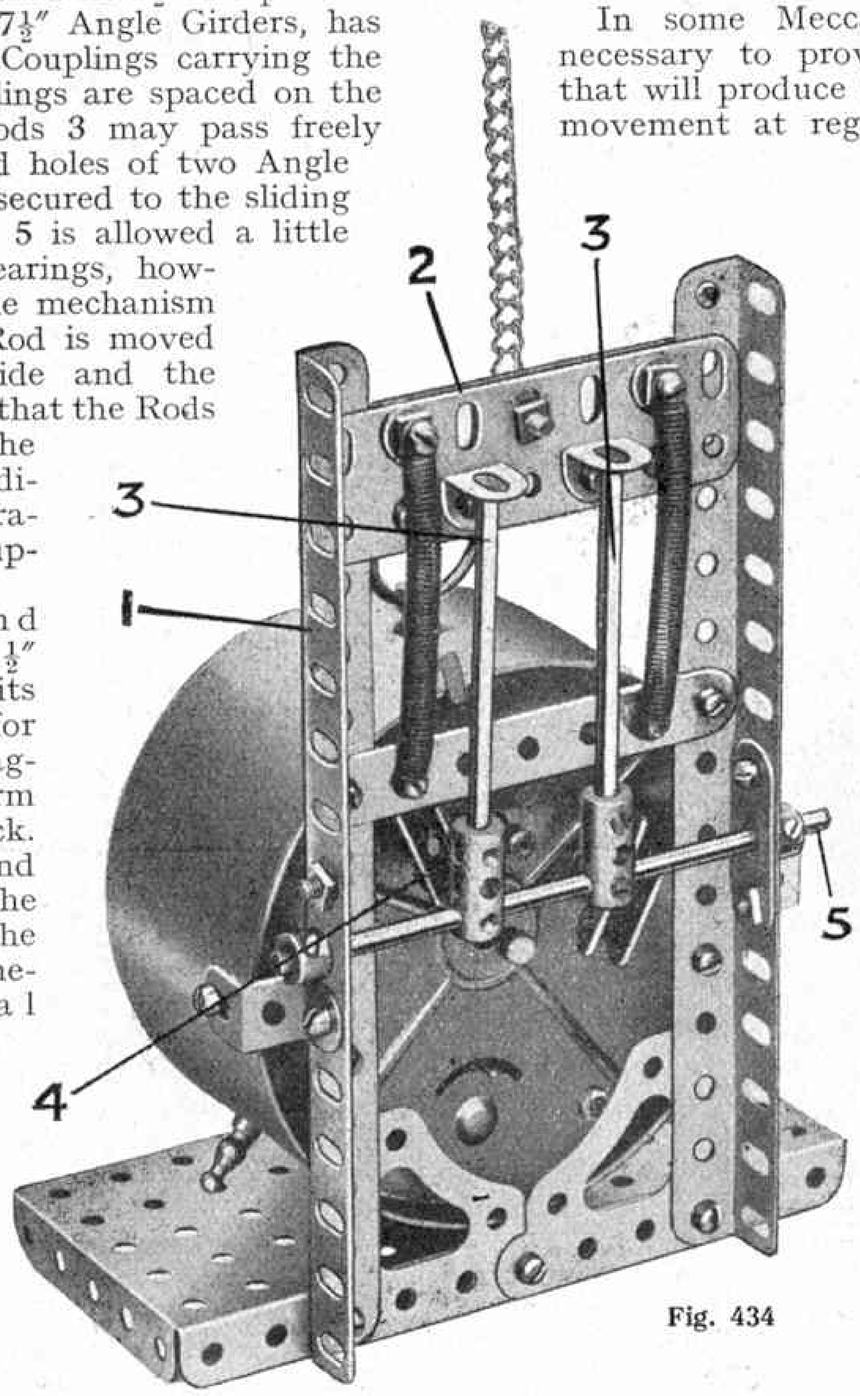


Fig. 434

In most electric light and power switches of the tumbler pattern, the lever is raised when in the "off" position. It is necessary therefore to mount the Meccano model above it in an inverted position, or to pass the Sprocket Chain over a Sprocket Wheel placed above the switch before securing it to the latter.

(435) Quick Action Cam

(H. Smith, York)

In some Meccano models it is necessary to provide a mechanism that will produce a sharp downward movement at regular intervals. An example of this is found in a Meccano Loom, the downward movement being utilised to operate the picking motion, which requires a quick movement to throw the shuttle across the slay. This motion can be produced by a cam of the type shown in Fig. 435. It is built up from two Bush Wheels, three holes in each of which carry ½″ Bolts. Each of these Bolts carries a Collar on its shank, and the three Collars in this way form a suitable cam surface.

The tappet arm is built up from two 5½″ Strips bolted together at the moving end by two nuts and bolts. One of these bolts also holds a 2″ Flat Girder in place, and the other, although passing through both the Flat Girders and Strips, is a pivoted joint only, by means of which an End Bearing is secured to the arm. The method of pivoting the arm is shown in Fig. 435.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

M207. A useful form of ball and socket joint, a device often required in Meccano mechanisms, can be made by gripping the head of a Handrail Support or Coupling between the prongs of a small Fork Piece. This idea is put forward by W. Stewart, Glasgow.

M208. L. Bold, York, suggests a novel method of making an improvised universal coupling for transmitting a light drive. His idea is to couple two Rods together by means of a Spring (Part No. 43), which is clamped at each end in the prongs of an End Bearing.

M209. H. Burke, Southampton, and others, suggest that the 50-teeth Gear should be manufactured with holes drilled through it like the 57-teeth Gear. This would enable it to be used in many types of automatic mechanisms in which a gear wheel is required to rotate with its shaft, and yet to be slideable along it. Unfortunately the holes would have to be at the same distance from the centre as those in the 57-teeth Gear, and consequently would be too close to the teeth to be practicable. In any case such Gears would be limited in application, for nuts and washers used in bolting other parts in the holes would project beyond the teeth.

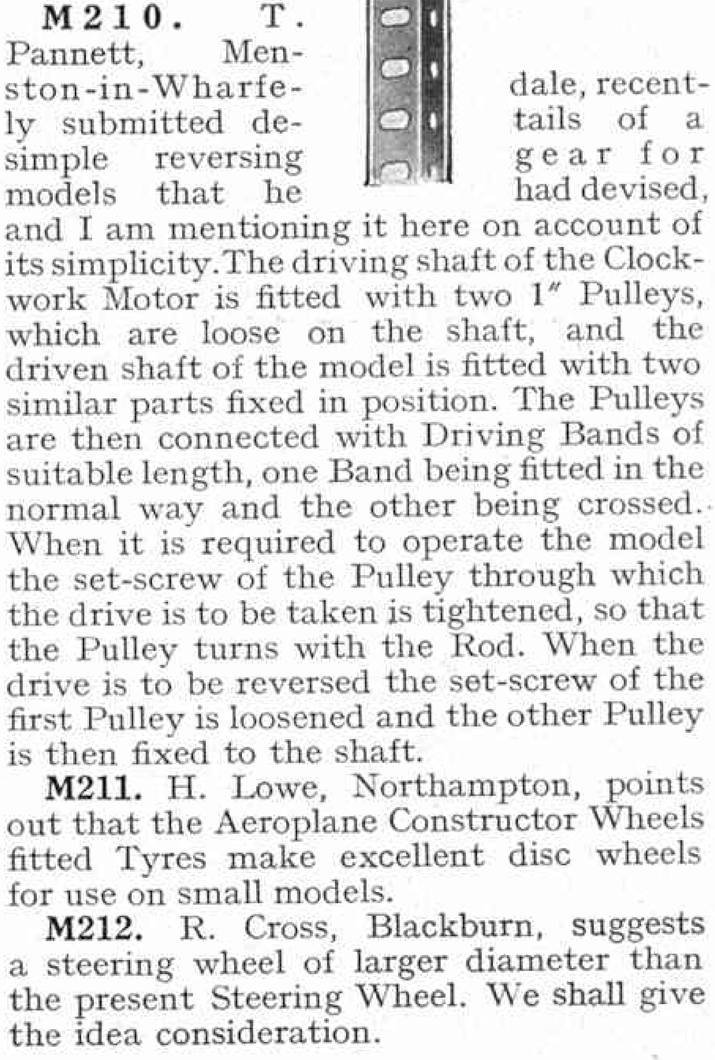


Fig. 435

M210. T. Pannett, Menston-in-Wharfedale, recently submitted details of a simple reversing gear for models that he had devised, and I am mentioning it here on account of its simplicity. The driving shaft of the Clockwork Motor is fitted with two 1″ Pulleys, which are loose on the shaft, and the driven shaft of the model is fitted with two similar parts fixed in position. The Pulleys are then connected with Driving Bands of suitable length, one Band being fitted in the normal way and the other being crossed. When it is required to operate the model the set-screw of the Pulley through which the drive is to be taken is tightened, so that the Pulley turns with the Rod. When the drive is to be reversed the set-screw of the first Pulley is loosened and the other Pulley is then fixed to the shaft.

M211. H. Lowe, Northampton, points out that the Aeroplane Constructor Wheels fitted Tyres make excellent disc wheels for use on small models.

M212. R. Cross, Blackburn, suggests a steering wheel of larger diameter than the present Steering Wheel. We shall give the idea consideration.

New Outfit Models

Rocking Horse—Gymnast—Electric Van—Tractor

THE four simple models illustrated on this and the opposite page are constructed with Outfits Nos. 0, 2, 3, and 4, and model-builders should have little difficulty in building them up with the aid of the accompanying description. The first model to be dealt with is an amusing rocking horse, which is driven by a *Magic* Motor and rocks backward and forward when the Motor is set in motion. The model is shown in Fig. 1 and is built from parts contained in Outfit No. 0.

The body of the horse consists of a *Magic* Motor, to which two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips and a $2\frac{1}{2}''$ Strip are attached to form the two hind legs and one of the fore-legs. The second fore-leg is built up from two Flat Brackets, and is fastened to a lug of the *Magic* Motor by an Angle Bracket. Two $5\frac{1}{2}''$ Strips curved as shown are secured to the lower ends of the legs to form rockers.

Two Flat Trunnions placed together represent the horse's head, and its "neck" consists of two $2\frac{1}{2}''$ small radius Curved Strips.

The mechanism for rocking the model to and fro is very simple and consists of a $5\frac{1}{2}''$ Strip 2 loosely attached to one of the hind legs by a bolt held in place by two nuts. The Strip 2 is connected by means of a $2\frac{1}{2}''$ Strip 1 to a Bush Wheel fixed on the winding spindle of the *Magic* Motor. As the spindle of the Motor revolves, the Strip 2 is moved up and down so that the horse is first rocked backwards as the Strip presses against the floor, and then rocks forward under its own weight as the Strip rises. The Strips 1 and 2 are bent slightly so that they do not jam against any part of the model.

Parts required to build model rocking horse: 3 of No. 2; 4 of No. 5; 3 of No. 10; 3 of No. 12; 1 of No. 24; 21 of No. 37a; 16 of No. 37b; 2 of No. 48a; 2 of No. 90a; 2 of No. 111c; 2 of No. 126a; 1 *Magic* Motor (not included in Outfit No. 0).

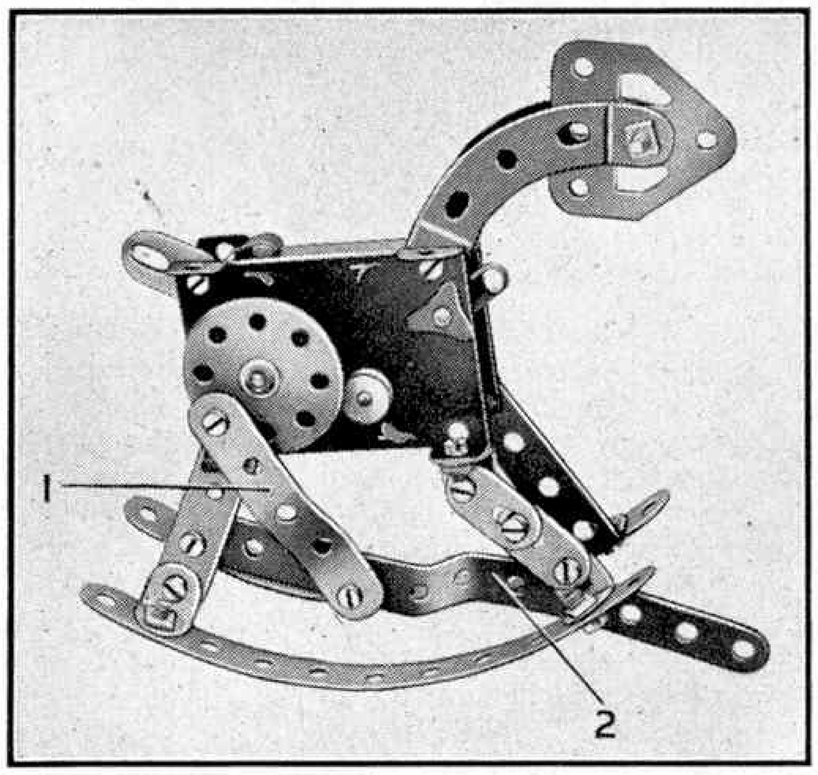


Fig. 1. When the Magic Motor of this Outfit No. 0 rocking horse is started, the model rocks backwards and forwards.

The model tractor and disc harrow illustrated in Fig. 2 are based on actual machines used on many farms for aerating and loosening the surface soil of cultivated fields. They are constructed from the contents of Outfit No. 3. The chassis of the tractor consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, and construction is commenced by overlapping two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates by two holes and attaching them at one end of the Plate by a Trunnion. The Flexible Plates form part of the radiator, which is completed by bolting a $2\frac{1}{2}''$ small radius Curved Strip to the upper Flexible Plate. The top of the engine bonnet is formed by two $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, which are bolted together overlapping three holes. The ends of the Plates are then bent as shown in the illustration, and they are attached to the Curved Strip of the radiator by an Angle Bracket. A $2\frac{1}{2}''$ Curved Strip is attached to the rear end of the bonnet by another Angle Bracket, and is supported from the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate by two $2\frac{1}{2}''$ Strips and Angle Brackets.

The engine unit is represented by two $1\frac{11}{16}''$ radius Curved Plates, which are bolted together overlapping two holes and are secured to the chassis under the bonnet by an Angle Bracket.

The rear wheels of the tractor are two Road Wheels fastened on a $3\frac{1}{2}''$ Rod passed through the flanges of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, but before they are fitted in position the mudguards are constructed. The latter consist of two 3" Formed Slotted Strips 2, attached by Angle Brackets to the Semi-Circular Plates 1 that are bolted to the Flanged Plate. The front wheels are formed by two $1\frac{1}{4}''$ Discs, which are mounted by $\frac{3}{8}''$ Bolts on two Flat Brackets bolted to the front of the chassis. The bolts attaching the Flat Brackets to the chassis are passed through the slotted holes of the Brackets, so that it is possible to adjust the position of the front wheels, to bring the chassis of the tractor into a horizontal position.

The driver's seat is constructed from a Flat Trunnion and a Trunnion, and is supported by a $2\frac{1}{2}''$ Strip from the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. To the front flange of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate a Flat Bracket carrying a $\frac{3}{8}''$ Bolt in its free hole, is bolted to represent the starting handle.

The frame of the disc harrow consists of two $5\frac{1}{2}''$ Strips which are joined at the sixth holes from their forward ends by a $2\frac{1}{2}''$ Strip, as shown in the illustration. Angle Brackets are bolted to the rear ends of the $5\frac{1}{2}''$ Strips and they form bearings for a 4" Rod that carries three 1" fast Pulleys, two 1" loose Pulleys and two $\frac{3}{4}''$ Discs representing the discs of the harrow. The $\frac{3}{4}''$ Discs and 1" loose Pulleys are spaced apart by Spring Clips.

The coupling hook by which the harrow is attached to the tractor consists of a Double Bracket bolted to the rear flange of the Plate forming the chassis of the tractor. The forward ends of the $5\frac{1}{2}''$ Strips of the harrow are placed between the lugs of the Double Bracket, and then secured to it by a $1\frac{1}{2}''$ Rod. The Rod is prevented from slipping out of position by a Spring Clip.

Parts required to build model tractor and harrow: 2 of No. 2; 4 of No. 5; 2 of No. 10; 1 of No. 11; 8 of No. 12; 1 of No. 15b; 1 of No. 16; 1 of No. 18a; 2 of No. 22; 2 of No. 22a; 6 of No. 35; 47 of No. 37a; 41 of No. 37b; 1 of No. 52; 2 of No. 90a; 2 of No. 111c; 1 of No. 125; 1 of No. 126; 1 of No. 126a; 2 of No. 187; 2 of No. 188; 2 of No. 191; 2 of No. 199; 2 of No. 214; 2 of No. 215; 2 of No. 217a; 2 of No. 217b.

A good example of the use of Flexible Plates in reproducing streamlined vehicles is given by the model electric van shown in Figs. 3 and 4. This model is built with the contents of Outfit No. 4 and is fitted with a No. 1 Clockwork Motor, which drives it along at a good speed. The chassis of the van consists of two $12\frac{1}{2}''$ Strips 2, placed with their flat sides vertical and joined at their centres by a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 1, and at their rear ends by a $5\frac{1}{2}''$ Strip and two Angle Brackets. The Flanged Plate 1 forms part of the floor of the van, the remainder of the floor being filled in by two $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flexible Plates. The rear Flexible Plate is connected for support to the Flanged Plate 1 by an Angle Bracket and to the $5\frac{1}{2}''$ Strip by two Flat Brackets. The other Flexible Plate is bolted directly to the Flanged Plate 1, overlapping it one hole.

To each Strip 2 are bolted one $5\frac{1}{2}'' \times 1\frac{1}{2}''$, one $2\frac{1}{2}'' \times 1\frac{1}{2}''$ and one $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate in that order commencing from the rear end of the model. On each side of the van a gap of $2\frac{1}{2}''$ is left between the $2\frac{1}{2}'' \times 1\frac{1}{2}''$

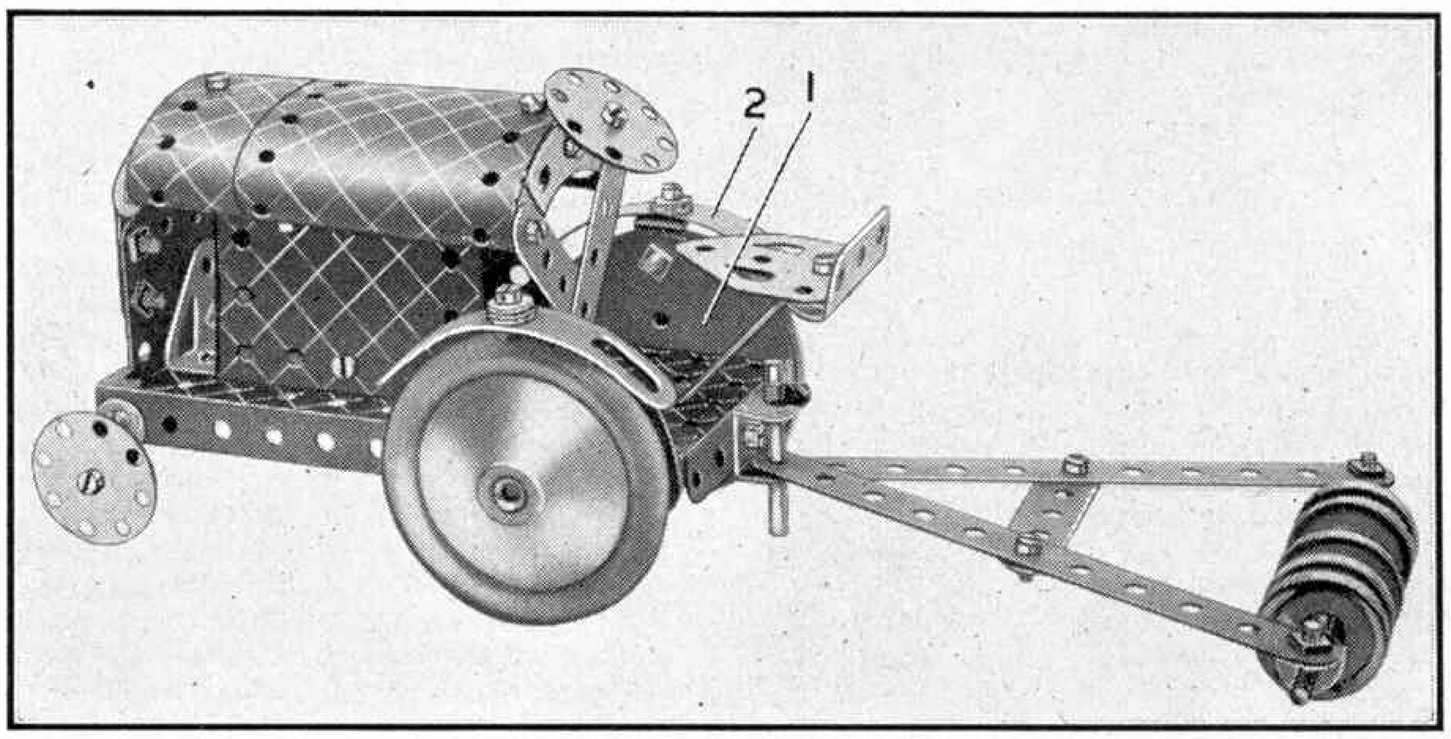


Fig. 2. This realistic model of a tractor and disc harrow is constructed from the contents of Outfit No. 3.

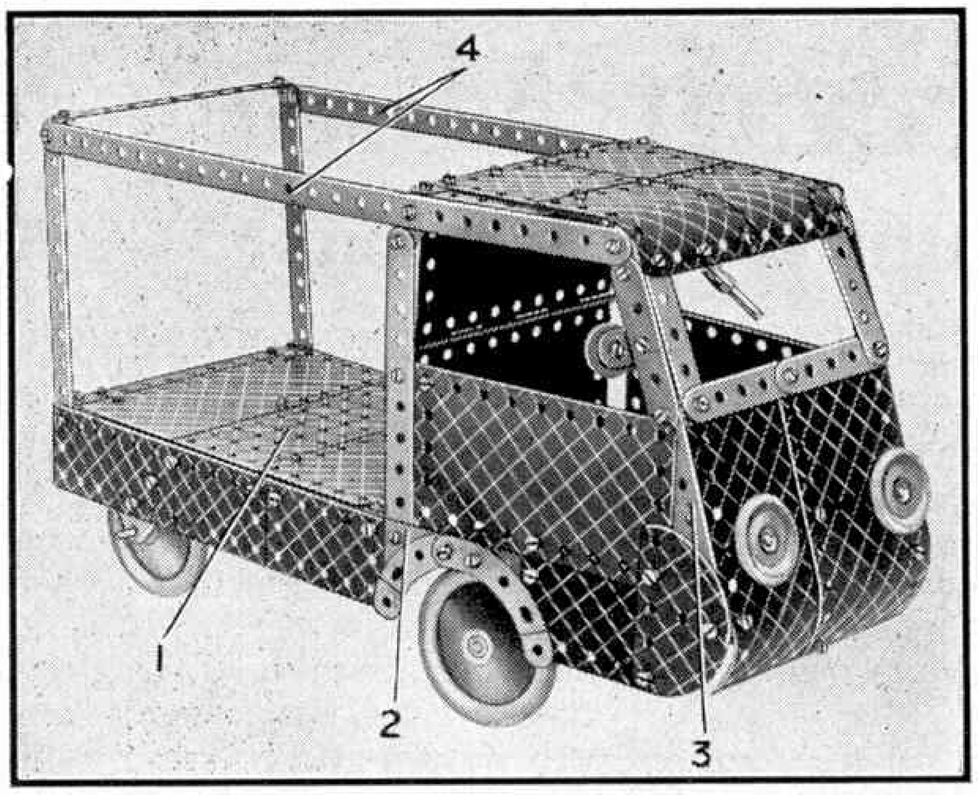


Fig. 3. An attractive and detailed model of a streamlined electric van built with Outfit No. 4.

and the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, and this is partially filled in by a $2\frac{1}{2}''$ small radius Curved Strip.

To the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate are secured a Semi-Circular Plate and a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. These two parts form a portion of the side of the cab, which is completed by adding a $5\frac{1}{2}''$ Strip behind the $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and a compound strip 3. The latter consists of a $3\frac{1}{2}''$ Strip extended by a $2\frac{1}{2}''$ Strip, and its lower end is bolted to the Semi-Circular Plate. The $5\frac{1}{2}''$ Strip and the compound strip 3 are each secured to a $12\frac{1}{2}''$ Strip 4 at their upper ends by a Flat Bracket. This is repeated on the other side of the van. The Strips 4 form the top of the framework of the body and are joined at their rear ends by a $5\frac{1}{2}''$ Strip and two Angle Brackets, the bolts holding also two further $5\frac{1}{2}''$ Strips, the lower ends of which are secured to the chassis.

The front of the cab is built up from two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and two U-Section Curved Plates, which are bolted together as shown and secured in position by Angle Brackets. The windscreen frame, which is formed by four $2\frac{1}{2}''$ Strips, is next added and is followed by the roof of the cab. The latter consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and two $1\frac{11}{16}''$ radius Curved Plates, the forward edge of the compound plate being bolted to the windscreen frame and the rear edge to a $5\frac{1}{2}''$ Strip fastened by Angle Brackets between Strips 4. A Hinged Flat Plate closes in the rear of the cab, but is not fitted in position until the steering mechanism has been assembled.

The steering mechanism is shown in Fig. 4. It is mounted on two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 5, which are fastened together at their inner ends by a bolt carrying four washers to space the Double Angle Strips apart. The compound double angle strip so formed is bolted between the Strips 2 of the chassis in the sixth holes from their forward ends. A Double Angle Strip 6, which carries at one end a Reversed Angle Bracket, is then secured to the Double Angle Strip 5 by two Trunnions. On one of the Reversed Angle Brackets a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 7 and a Double Bracket are mounted pivotally by a lock-nutted bolt, and the other carries a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 8 and a Double Bracket. The holes in the lugs of the Double Bracket provide bearings for the $1\frac{1}{2}''$ Rods forming the stub axles for the front Road Wheels. The $1\frac{1}{2}''$ Rods are each held in position by a Spring Clip.

The Double Angle Strips 7 and 8 are joined, as shown in Fig. 4, by two $2\frac{1}{2}''$ Strips overlapped three holes. The bolts joining the Double Angle Strips to the compound strip are lock-nutted so that the Double Angle Strips are still free to move. The forward end of the Double Angle Strip 8 is also connected by a compound strip 9, consisting of a $2\frac{1}{2}''$ Strip and a Flat Bracket, to a Bush Wheel on the bottom of the steering column. The Bush Wheel carries also a $\frac{3}{8}''$ Bolt fastened in position by two nuts, which prevent the wheels being turned too far in one direction so that the steering is locked.

The steering column is a $4''$ Rod passed through a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 10 bolted to one of the Double Angle Strips 5, and it carries at its upper end a $1''$ Pulley complete with Rubber Ring to represent the steering wheel. Additional support for the steering column is provided by a Cranked Bent Strip attached to the Plate 10. Two Spring Clips prevent the steering column from sliding in its bearings.

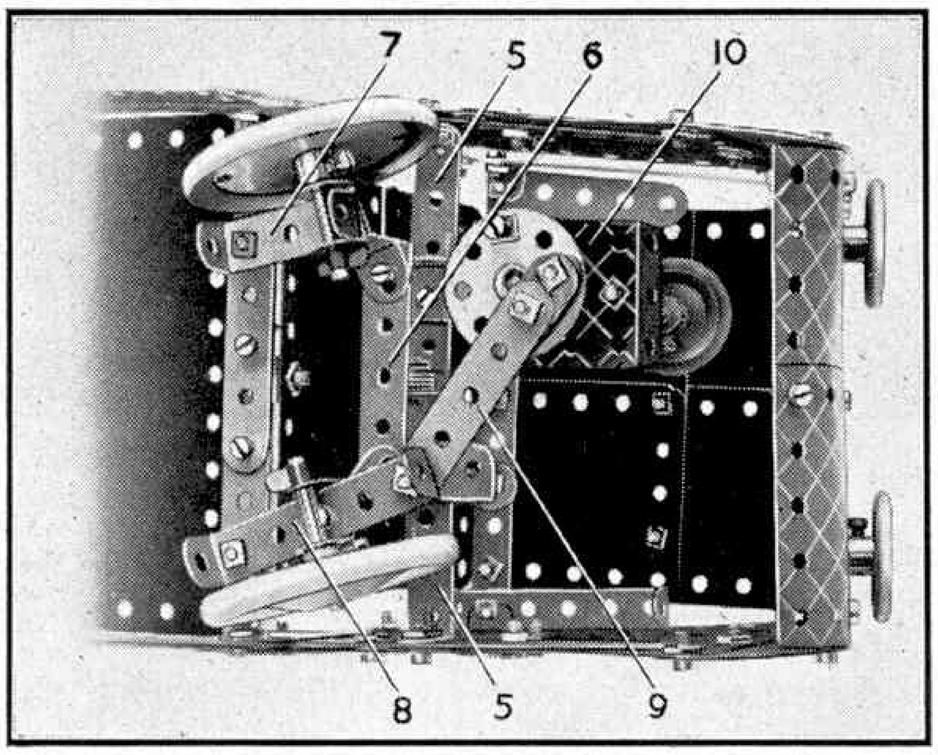


Fig. 4. An underneath view of the front of the electric van shown in Fig. 3.

All that now remains to be done is to complete the cab and fit the rear axle. The Hinged Flat Plate forming the back of the cab is fitted in position by Angle Brackets, and the headlights, windscreen wiper and mirror are then added. The mirror is a $\frac{3}{4}''$ Disc supported by an Obtuse Angle Bracket from one of the Strips 3, and the windscreen wiper consists of a $1''$ Rod secured to the windscreen frame by a Rod and Strip Connector. The headlights are two $1''$ Pulleys complete with Rubber Rings and they are mounted on the shanks of two $\frac{3}{8}''$ Bolts passed through the front of the cab.

The rear axle is formed of a $2''$ and a $4''$ Rod, joined by a Rod Connector. It carries a $1''$ Pulley, and revolves in Flat Trunnions attached to the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates that are bolted to the sides of the chassis. The two Road Wheels on the rear axle are each spaced from the Flat Trunnions by two Washers so that they do not rub against the bolts holding the Flat Trunnions in position.

The method of mounting the No. 1 Clockwork Motor to drive the van is as follows. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is fastened by means of its turned-up ends between the longer flanges of the Flanged Plate 1 forming part of the floor of the van. The Double Angle Strip is $4''$ from the off side of the van, that is, the side seen in Fig. 3. The Clockwork Motor is bolted to the Double Angle Strip so that its control lever points forward. The $1''$ Pulley on the rear axle is connected by a $2\frac{1}{2}''$ Driving Band to the bare driving shaft of the Clockwork Motor. The Driving Band is prevented from slipping off the driving shaft by a $1''$ Pulley.

Parts required to build model electric van: 4 of No. 1; 8 of No. 2; 2 of No. 3; 9 of No. 5; 5 of No. 10; 2 of No. 11; 8 of No. 12; 4 of No. 12c; 2 of No. 15b; 1 of No. 17; 2 of No. 18a; 1 of No. 18b; 2 of No. 22; 1 of No. 24; 4 of No. 35; 75 of No. 37a; 81 of No. 37b; 4 of No. 38; 1 of No. 44; 1 of No. 48; 6 of No. 48a; 1 of No. 51; 1 of No. 52; 4 of No. 90a; 2 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a; 3 of No. 155a; 1 of No. 186a; 4 of No. 187; 2 of No. 188; 2 of No. 189; 4 of No. 190; 2 of No. 191; 2 of No. 192; 1 of No. 198; 2 of No. 199; 2 of No. 200; 1 of No. 212; 1 of No. 213; 2 of No. 214; 1 of No. 217b. 1 No. 1 Clockwork Motor (not included in Outfit).

An amusing and attractive model for owners of an Outfit No. 2 or one larger is the performing gymnast shown in Fig. 5. Its construction is commenced by building up the base, which consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to the flanges of which are bolted two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and two compound plates, each consisting of a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. The edges of the compound plates are then braced by $2\frac{1}{2}''$ and $5\frac{1}{2}''$ Strips.

The next step in the construction is to bolt two $5\frac{1}{2}''$ Strips in a vertical position to the centres of the longer flanges of the Flanged Plate. These Strips are supported by two $2\frac{1}{2}''$ small radius Curved Strips arranged as shown in the illustration. A $3\frac{1}{2}''$ Rod is passed through the upper end holes of the $5\frac{1}{2}''$ Strips and this forms the bar around which the gymnast pivots. The Rod is fitted with a Bush Wheel between the $5\frac{1}{2}''$ Strips, and at one end carries a $1''$ Pulley, which is connected by a belt of Cord to a $1''$ Pulley on a Crank Handle journalled in the base.

The body of the gymnast is represented by a Flat Trunnion, and in the hole at the narrow end of this part two Flat Brackets and an Angle Bracket are bolted.

Parts required to build model gymnast: 4 of No. 2; 6 of No. 5; 4 of No. 10; 8 of No. 12; 1 of No. 16; 1 of No. 19g; 2 of No. 22; 1 of No. 24; 2 of No. 35; 38 of No. 37a; 36 of No. 37b; 1 of No. 52; 2 of No. 90a; 1 of No. 111c; 1 of No. 126; 1 of No. 126a; 2 of No. 188; 2 of No. 190; 2 of No. 191.

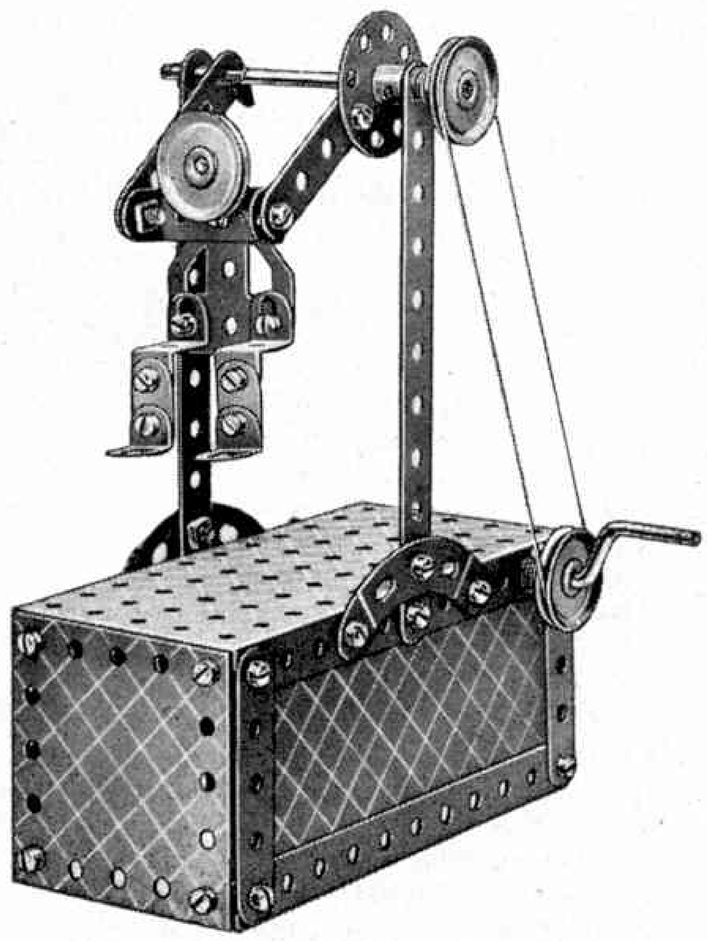


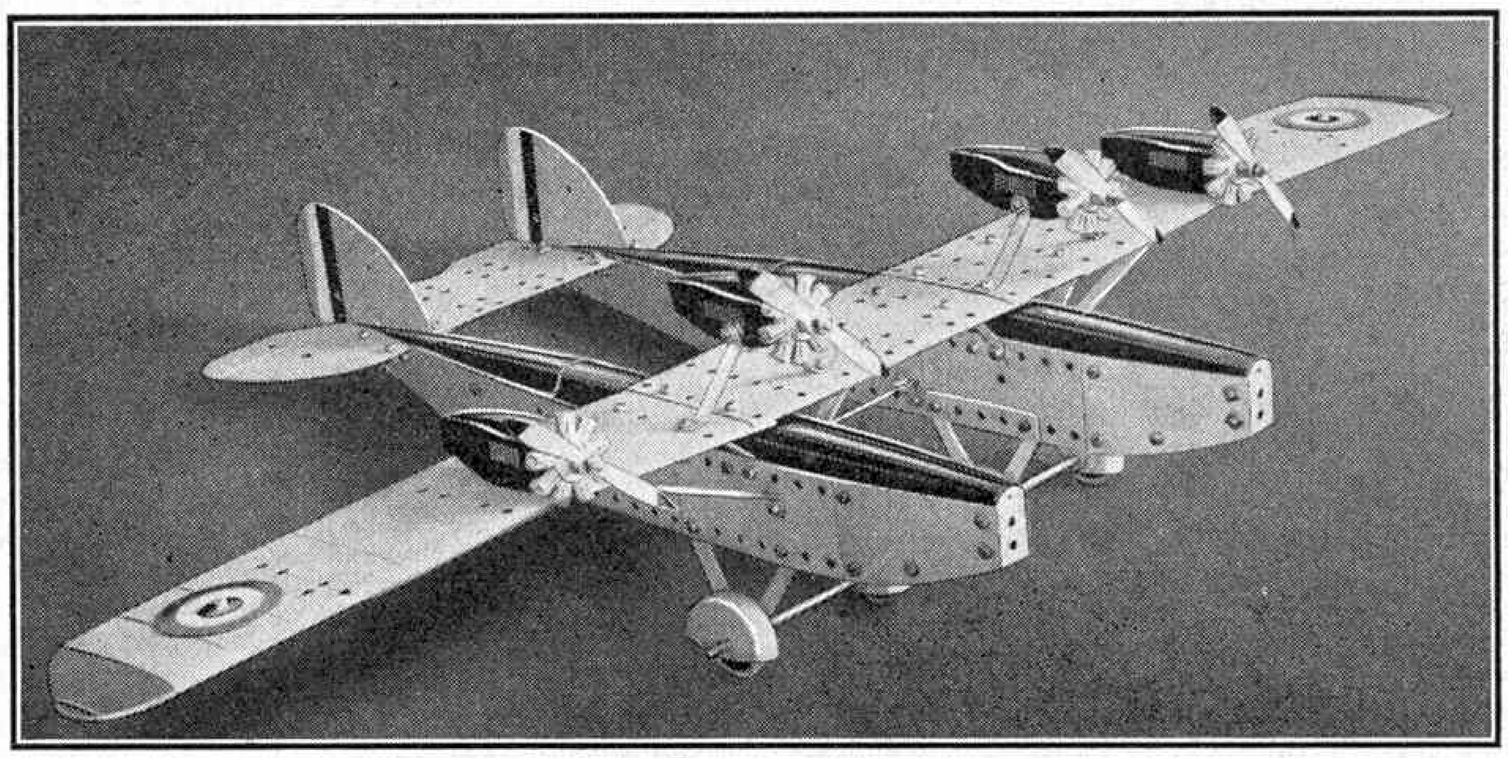
Fig. 5. Outfit No. 2 is all that is required to construct this amusing working model of a gymnast.

Fine Prizes for Aircraft Models

"Aeroplane Constructor Outfit" Competition

Aeroplanes are so much in the news to-day that we think it an excellent opportunity to arrange another of the popular "Aeroplane Constructor" competitions. The parts contained in the Meccano Aeroplane Constructor Outfits allow their owners to build up for themselves models of almost any type of aircraft, both civil and military, and as there are now many thousands of lucky possessors of these Outfits, we expect to receive a very large number of entries.

Competitors may choose any type of aeroplane or seaplane for their subject, but the model must be built from Meccano Aeroplane Constructor parts. Competitors who possess an ordinary Meccano Outfit may use a few standard parts in conjunction with the Aeroplane Constructor parts if they wish, but the principal portions of the model must be made with the Aeroplane parts.



This twin fuselage air liner is a typical example of the fine models that can be assembled from Aeroplane Constructor parts. It was built by J. Jenkinson, Rochdale.

Competitors must not copy the models illustrated in the Aeroplane Constructor Instructions Manuals. They should first of all select a suitable prototype, which may be either a civil machine or a military aircraft, and then reproduce it as closely as possible. There should be no difficulty in finding suitable aeroplanes on which to base a model, for hundreds of illustrations of real aeroplanes that will make good subjects appear regularly in the "*M.M.*" and others are frequently also in the daily press. Competitors should be careful in choosing their subjects, however, and should endeavour to select those that it is possible to reproduce accurately with the parts available. The prizes will be awarded to the builders of the models that most closely resemble the machines they represent.

It is only necessary to send either photographs or drawings of models. Actual models must not be sent. In addition to illustrations of their models, however, competitors may send any necessary explanations concerning their construction. These should be written neatly on a separate sheet of paper, and should be as brief as possible.

Each competitor must write his name, age and full address on the back of each photograph or drawing sent in, and all entries must be addressed "*Aeroplane Constructor Outfit Model-Building Competition*," Meccano Ltd., Binns Road, Liverpool 13.

Entries in this competition will be divided into two Sections: A, for competitors of all ages living in the British Isles; B, for competitors of all ages living Overseas. The age of a competitor will be taken into consideration in assessing the merits of his work. The closing date for Section A will be 29th April, but Section B will remain open until 31st May.

The prizes to be awarded in each Section are as follows: First, Meccano or Hornby products value £3/3/–. Second, products value £2/2/–. Third, products value £1/1/–. There will be also five prizes of products value 5/–.

Your Last Chance to Win a Valuable Cheque!

The closing date of the "New Year" Model-Building Competition is rapidly drawing near and there are now only just over four weeks in which to make the most of this splendid opportunity to win a valuable cheque. Full details of the competition were published in the January and February issues of the "*M.M.*," but as the contest will remain open until 31st March, we are giving a final reminder to intending competitors who have not yet completed their entries.

The competition is open to all model-builders, and is arranged so that no matter how young an entrant may be, or how small his Outfit, he will stand just as good a chance of winning one of the splendid prizes as older competitors with large Outfits at their disposal. Every model-builder who has not yet begun to prepare his entry should do so now, and a special invitation is given to all who have not previously taken part in "*M.M.*" competitions.

Entrants can choose their own subjects, and models of aeroplanes, cranes, all kinds of motor vehicles, machines and architectural subjects are all suitable for this competition. Any size of Meccano Outfit or any number of parts may be used, and there is no age limit or restriction of any kind.

The actual model built for entry must not be sent. Instead it is only necessary to forward a good photograph or, if this is not possible, a good drawing. A small photograph will do, provided it is clear enough to show the details of the model, and neither photographs nor drawings need be prepared by the competitor himself, provided that the model itself is entirely his own work.

Each competitor should write his name, age and full address on the back of each of the photographs or drawings he submits, and should enclose these, together with a brief description of the model, in an envelope addressed "*New Year Model-Building Competition*," Meccano Ltd., Binns Road, Liverpool 13. Entries must be posted in time to reach this office not later than 31st March.

The prizes include cheques and also Meccano and Hornby products. The chief of these are as follows: First, Cheque for £5/5/–; Second, Cheque for £3/3/–; Third, Cheque for £2/2/–. Other prizes are 10 consisting of Meccano or Hornby products to the value of 10/6 and 10 of products value 5/–.

Model-Building Competition Results

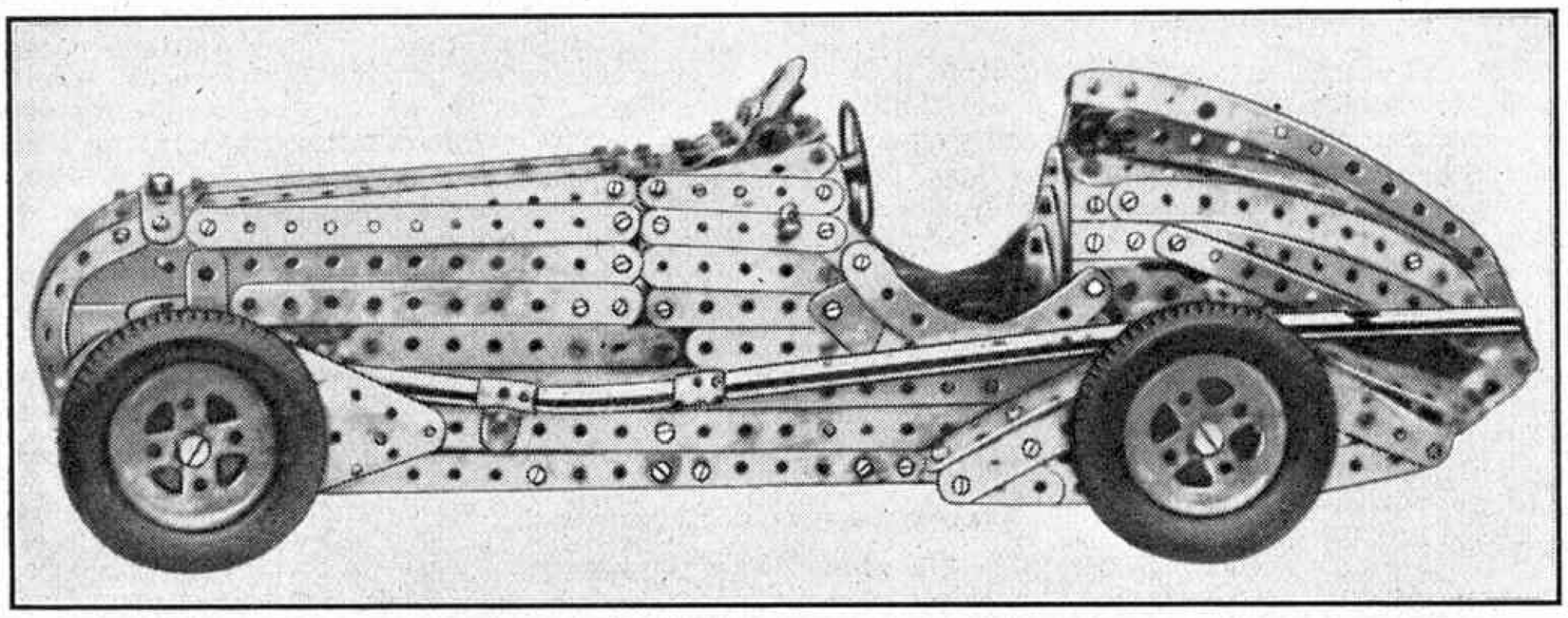
By "Spanner"

September "Suggestions" Contest

The complete list of prize-winners in the "Suggestions" Model-Building Competition that was announced in the September 1938 *"M.M."* is as follows:

1st Prize, Meccano or Hornby products value £2/2/–: C. Beese, Hamilton, Ontario. 2nd, products value £1/1/–: G. Worraker, Sidmouth. 3rd, products value 10/6: P. Hands, Hillingdon.

Products value 5/–: D. Thornton, London N.W.4; F. Boltman, Heidelberg, South Africa; H. Everett, Wrotham, Kent; A. Spring, Cainscross; P. Swan, Rangoon, Burma.



A well-built model racing car by A. Cole, Broadchalk, who was awarded a prize in the "Summer" Competition.

Most of the prize-winning entries are so interesting that I intend to illustrate and describe them fully in *"Suggestions Section"* in due course. This month therefore I am referring only briefly to those that won the principal awards.

First Prize was awarded to C. Beese, Hamilton, Ontario, for a model of a carrier of a type used on many Canadian farms for transporting hay from waggons into barns. The carrier consists of a carriage that runs on an overhead rail, and from it is suspended a pulley block. The load of hay is attached to the pulley block by slings, and then the carriage is hauled along the rails to the barn.

The rope by which the carriage is hauled is passed around guide pulleys so that it is possible to take the end of it through the barn door and attach it to a tractor or horse team outside. An interesting feature of the device is that the carriage is locked on the rail while the load is being hoisted or lowered. When the load is hoisted to its maximum height the pulley block makes contact with a trip lever on the carriage, and so releases the locking gear. This mechanism simplifies the operation of the hoist, as only one cord is needed for both hoisting and travelling movements. Beese also built a hay cart and a barn rack, and therefore was able to show his carrier in action.

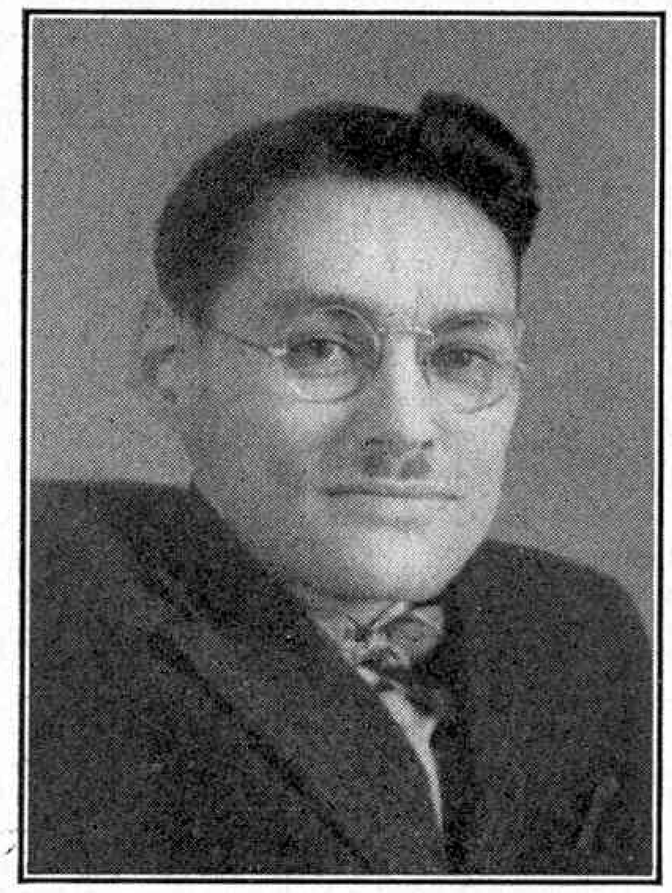
One entry that I liked very much was a small differential mechanism that is just the thing for building into small model cars. The gear was designed by G. Worraker, Sidmouth, and is one of the tiniest that I have seen. I advise all those who are interested in such matters to look out for a description of it in *"Suggestions Section."*

Another tit-bit from the entries that I know will interest many model-builders is an electrically operated suspension grab. This was submitted by P. Hands, Hillingdon, and is exactly what is wanted to add a touch of originality to a model crane. The chief item in the mechanism of this device is a small electro-magnet built into the top of the grab. Normally the current supply to the magnet is switched off, and the jaws hang open. When the current is switched on, however, the electro-magnet attracts a movable frame, and this action closes the jaws by means of a system of levers.

As I expected, there were many suggestions for various motor car mechanisms, and while there was nothing exciting about most of these a few attracted my attention on account of their novel construction. One of these was a "knee-action" front wheel springing arrangement of the type used on some modern motor cars. It was sent by P. Swan, Rangoon. The wheels are mounted on two pivoted parallel arms cushioned with coil springs, and therefore are free to rise or fall independently of each other when passing over ruts or lumps in the road surface. The coil springs give a smoother action than that obtained with most leaf spring systems.

Another competitor interested in motor cars was A. Spring, Cainscross, who submitted front and rear wheel springing arrangements, and also a novel internal expanding brake.

H. Everett also sent in several suggestions for mechanisms for model vehicles.



Carl W. Beese, Hamilton, Ontario, has won several awards in "M.M." Competitions, including First Prize in the "Suggestions" Contest, the results of which are announced on this page.

"Limited Parts" Simplicity Contest

The prize-winners in the "Limited Parts" Simplicity Competition, which was announced in the October 1938 *"M.M."* are as follows:

Home Section.

1st Prize, Meccano or Hornby products value £2/2/–: B. Cooke, London W.3. 2nd, products value £1/1/–: J. Usher, Dundee. 3rd, products value 10/6: J. Waters, London.

Products value 5/–: R. Beckman, London S.W.17; L. Gardner, London N.1; F. Mills, Kearsley; S. Copley, Nottingham; F. Whalley, Wallasey; H. Everett, Wrotham; H. Cannon, London N.14; F. Pritchard, Preston; E. Smith, Kilmarnock; P. Hands, Hillingdon.

Overseas Section.

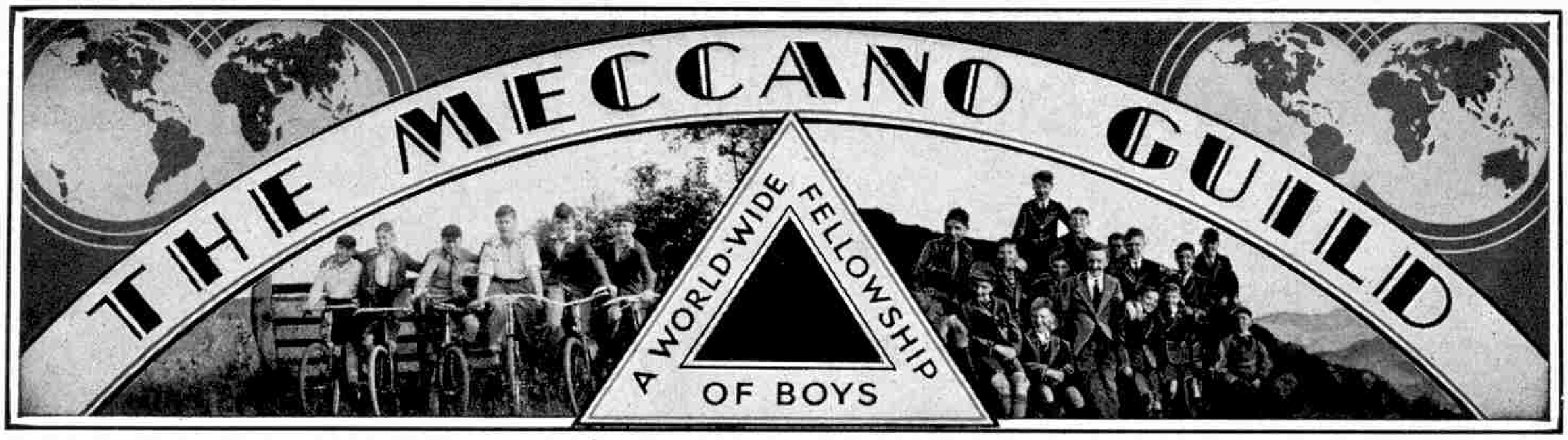
1st Prize, Meccano or Hornby products value £2/2/–: R. van Berkum, Fenwick, Canada. 2nd, products value £1/1/–: E. Tapper, South Perth, West Australia; 3rd, products value 10/6: D. Anglin, Toronto.

Products value 5/–: P. Gilles, Montpellier, France; O. Parker, Brussels, Ontario; M. Lo Piparo, Milan; L. Linder, Stockholm; L. Edwards, Freemans Bay, Auckland; G. Philpott, Okuku, New Zealand; C. Reade, Taumarunui, New Zealand; R. Johnson, Bombay; L. Phillips, Singapore; R. Smith, Valletta, Malta.

In the Home Section B. Cooke, Acton, London W.1, won First Prize with a tiny model vice, each jaw of which consists of a 1½" Angle Girder mounted on a Coupling. The fixed jaw is fastened to a Double Bracket by two bolts, which are passed through the lugs of the Double Bracket and screwed into the Coupling. A 3½" Strip is fastened to the bottom of the other jaw, and its free end is passed between the Coupling of the fixed jaw and the Double Bracket to which it is attached. The vice is opened or closed by means of a Screwed Rod working in the Couplings.

First Prize in the Overseas Section was awarded to R. van Berkum, Fenwick, Ontario, for a model of a spinning wheel. Although only the main features of the prototype are reproduced, the 10 parts used are cleverly arranged.

Second Prize in the Overseas Section was awarded to E. Tapper, South Perth, West Australia, for a model hydroplane, and J. Usher, Dundee, who submitted a small meccanograph obtained a similar success in the Home Section. The action of this model is extremely simple and it is capable of producing quite a number of interesting designs.



Exhibition Attractions

Preparations are now in full swing for the Exhibitions that in so many clubs bring the Winter Sessions to a close. At these Exhibitions splendid displays are made of models built by members, and a Hornby layout usually forms one of the principal attractions. This feature is always highly appreciated by visitors, especially when a well-arranged service of passenger and goods trains is run and members practice the operations beforehand so that everything goes smoothly and easily on the great occasion itself. The interest of visitors is increased when a card displayed near the layout explains to them exactly what is being done on the track.

Sideshows of various kinds add greatly to the fun of an Exhibition especially if they give visitors themselves something to do. Simple competitions have this desirable effect. For instance, visitors can be asked to estimate the number of nuts and bolts and other small Meccano parts that a sealed glass jar contains. Similar competitions can be arranged with models, those present being asked to estimate the number of nuts and bolts used in its construction, or the number of holes in the Strips and Plates of which it is built. In any event of this kind a charge of say 1d. could be made for each estimate, and a small prize should then be awarded to the competitor whose estimate is nearest the actual number.

A Useful Meccano Model

The Meccanograph provides another fascinating little sideshow. Visitors who see the marvellous variety of designs that can be drawn with this model feel an urgent desire to adjust and operate it themselves, and their wishes can be gratified for a small fee. For this purpose the model should be placed in charge of one or two senior members of the club, who should prepare beforehand striking designs to be displayed in a prominent position above the model so as to attract attention. Designs are most striking when carried out in coloured inks instead of pencil, but an equally good plan, especially for use during an Exhibition itself, is to mark the sheets, preferably of thin card, through a sheet of carbon paper placed under a covering sheet. A hard pencil or even a steel point can then be used on the writing arm of the Meccanograph itself.

A cinematograph display is always greatly enjoyed. In some cases there are cine-camera enthusiasts in the club who can arrange one, but other clubs need have little difficulty, for to-day it is a simple matter to obtain films on hire. There are several of great interest in the list of Lantern Lectures that I have prepared as a guide to clubs and Branches. This list gives details of Lectures and films loaned by railway companies and industrial firms, and explains how to apply for them. I shall be glad to send a copy to any Leader who is contemplating the inclusion of such a display.

Italian Club's Enterprise

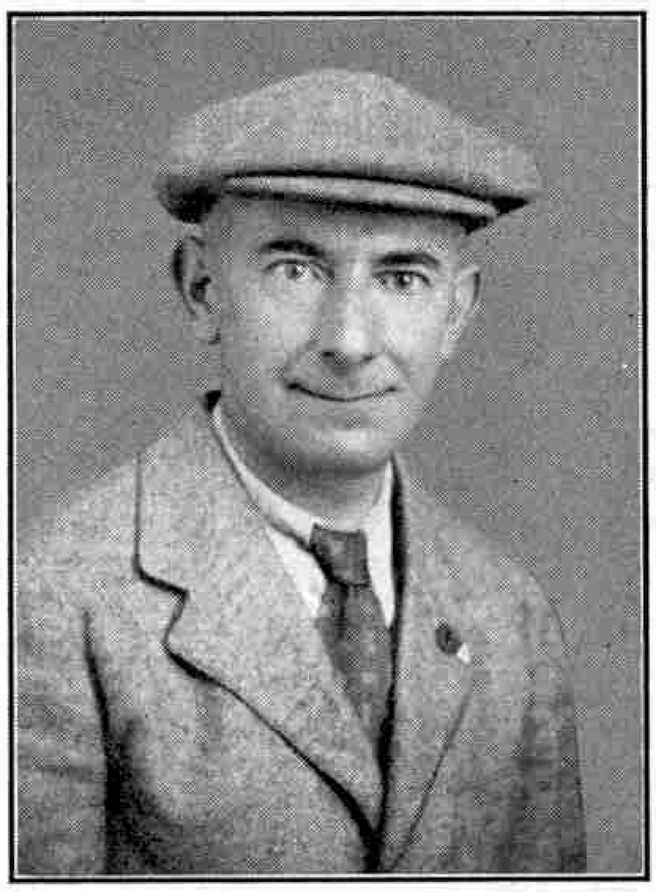
One of the chief aims of the Meccano Guild is to encourage the formation of a world-wide brotherhood of Meccano boys, and it is with this in mind that the Guild Correspondence Club was started. A very interesting letter I have received from the secretary of the Milan M.C. has shown how well this organisation is serving its purpose. The members of this enterprising Italian club are so keen on correspondence with English members that at first they tried to read their letters by slowly translating them word by word from a dictionary. Later their President helped them by providing translations and now the secretary is learning English, while special efforts are being made to acquire new members with knowledge of foreign languages.

These steps show how enthusiastic the members of the Milan club are. No effort is too great if it helps them to form friendships with Guild members in other countries, and the secretary of the club makes special reference to the pleasant and friendly spirit in which correspondence is carried out.

Members of the Guild in any part of the world who wish to join in this international correspondence can do so free of charge and I will send the necessary form to anyone interested.

Meccano Club Leaders

No. 97. Mr. M. C. Hodder



Mr. M. C. Hodder is Leader of the Exeter M.C., which celebrated its 21st birthday in December of last year. He became associated with the club in 1920, and since then has guided its fortunes with great skill and judgment. The club is now controlled by a board of directors elected from members, with their Leader as Chairman, and a remarkably active programme of Model-building, Sports and Debates is carried out.

Coming Events

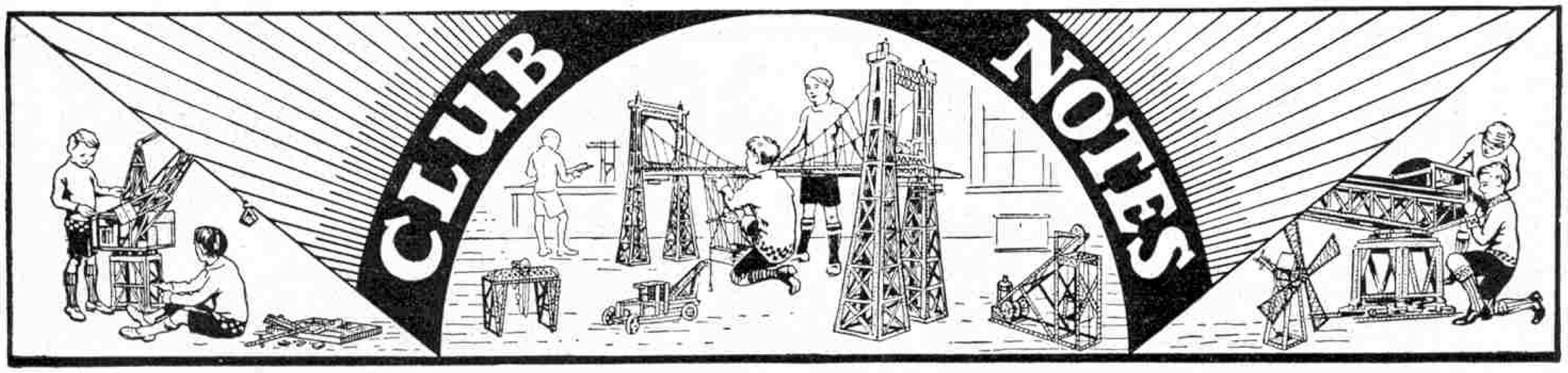
I wish to remind readers living in the Kidderminster district that the Exhibition arranged by the Kidderminster club will be open until Saturday 4th March. The Exhibition is being held at Railway House, Prospect Hill, Kidderminster, and from Wednesday 1st March to Friday 3rd March will be opened at 6.45 p.m., while on Saturday 4th March there will be three displays, at 2.30, 6.30 and 8.30 p.m. respectively. The many attractions include a film show, and there will be a silver collection for adults, the price of admission for children being 2d.

Another attractive Exhibition this month will be that of the Acton Branch of the H.R.C. This will take place on 2nd, 3rd, and 4th March at the Branch Hall, 261, The Vale, London W.3. The Exhibition will be open from 7 p.m. until 9.30 p.m. except on Saturday 4th March, when the opening time will be 3 p.m. The exhibits will include a large clockwork Hornby Railway, Meccano models built by members of the Branch and photographs, and the charge for admission will be 6d. for adults, 3d. for children. Tickets are now available and may be obtained from the secretary.

Meccano enthusiasts in the Thornton Heath district should keep in mind the exhibition that is being arranged by the St. Oswalds M.C. for 1st April. This will take place in St. Oswalds Hall, Norbury, and will be open from 6 to 9.30 p.m. There will be a display of models and the associated Branch will operate a Hornby Railway. The prices of admission will be 3d. for adults, 2d. for children.

Proposed Clubs

CHIPPING NORTON—N. Caswell, 12, Finsbury Place.
COVENTRY—R. H. Groves, 140, Stoney Stanton Road.
IPSWICH—A. C. Readwin, 17, Dalton Road.
LEYLAND—R. A. Bannister, 10, Ruskin Avenue, Hough Lane.



Winchmore Hill Collegiate School M.C.—A new committee has been elected. During a general discussion of club affairs a vote was taken to discover the most popular programme feature, and model railway working was placed first. A realistic model of a dinner gong won first prize in a recent "Simplicity" Competition. A Film Show held recently was much enjoyed. Club roll: 28. *Secretary:* F. J. Hearn, 143, Conway Road, Southgate, London N.14.

Bryntirion School M.C.—Good progress is being made in the second of the Winter Sessions, and extensive preparations have been made for the Exhibition, to be held on 19th March. A very successful Social Evening also has been held. Club roll: 18. *Secretary:* E. S. Milner, Bryntirion School, Bridgend.

St. Stephens (Saltash) M.C.—Finishing touches have been put to a fine Meccano model traction engine. Satisfactory progress has been made in general model-building work, and models in hand include a Handley Page "Hercules" air liner and St. Paul's Cathedral. Club roll: 7. *Secretary:* B. R. J. Braund, 9, Homer Park, Saltash.

Malone M.C.—A new Leader and secretary have been elected. Model-building is in full swing, and many models are being built for the weekly meetings and for entry in competitions. A Debate dealt with the respective merits of the Boy Scout and the Boys Brigade movements. General Knowledge Tests have been held at several meetings. Club roll: 6. *Secretary:* H. A. Courtney, 60, Maryville Park, Malone Road, Belfast.

Coloured Mission (Cardiff) M.C.—The success of a model in the "Autumn" Model-Building Contest announced in the "*M.M.*" has given special pleasure, as the model entered was the first submitted in these contests by a member of the club. Constructional work is in hand for an Exhibition to be held this month, models already completed including a destroyer, lorry, level luffing crane, and a tug towing a barge. Club roll: 18. *Secretary:* T. H. Binstead, 36, Penhill Road, Llandaff Fields, Cardiff.

The Beeches (Jersey) M.C.—Good progress continues to be made and many new members have been enrolled. "*Our Mag*," the official organ of the club, has reached its second issue. It is well printed and arranged, and gives full news of club events. Attendance tickets are issued to members present at meetings. The Headmaster kindly allows the club to use the School boxing and table tennis equipment. Club roll: 24. *Secretary:* H. Dubras, 57, King Street, Jersey.

Sid Vale M.C.—The Session commenced with the Annual New Year Party, when after an enjoyable tea members had a jolly time playing games. Excellent model steam rollers and traction engines have been built for entry in club Model-building Contests. The subject for one model-building evening was "Army Models." This aroused great interest, most members submitting models of Anti-Aircraft Guns and Searchlights. Club roll: 12. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

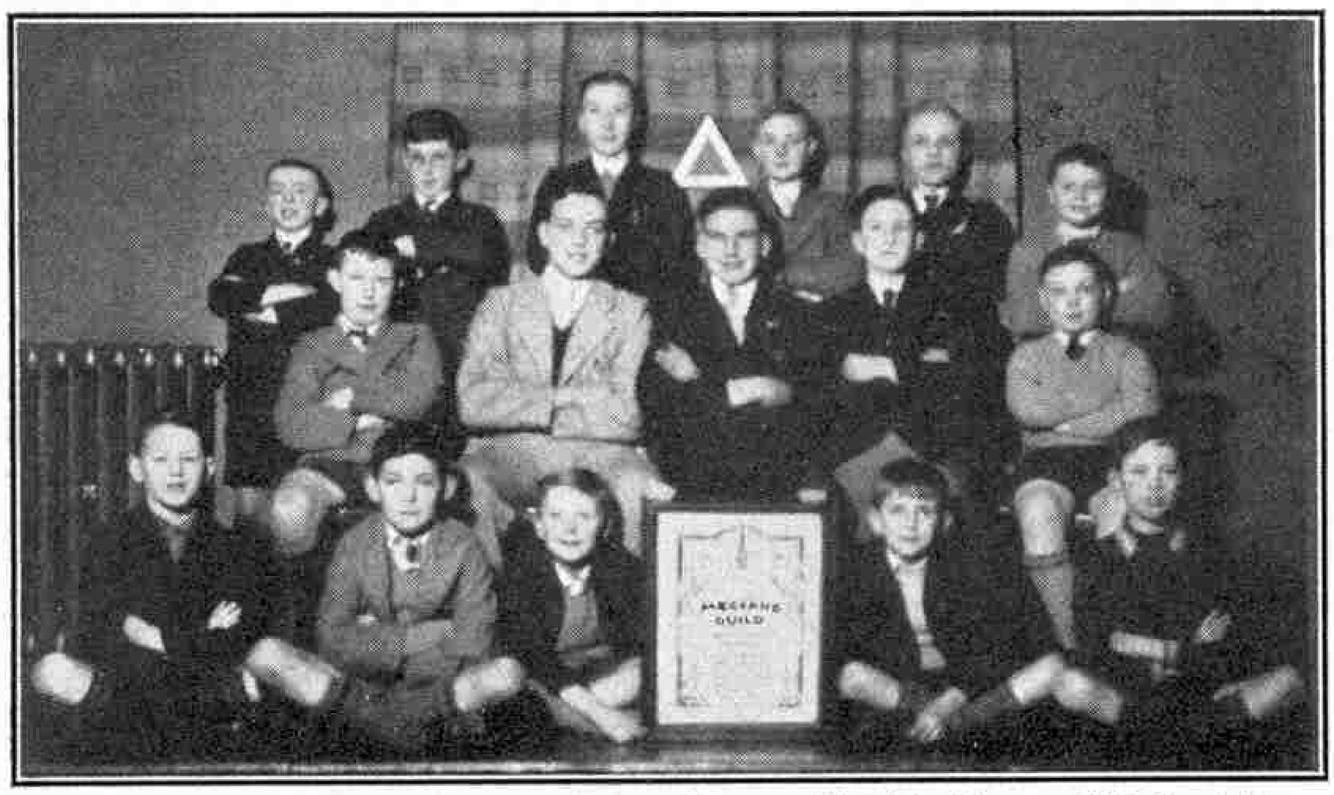
Mall School M.C.—A varied programme has been followed. A Treasure Hunt proved good fun, and Games Nights have been enjoyed. An interesting evening was spent in making tests of model locomotives and motor cars. A new secretary has been elected. Club roll: 35. *Secretary:* R. J. Petherbridge, 40, Wensleydale Road, Hampton, Middlesex.

Breich M.C.—There has been steady progress in model-building, and members are now more ambitious in regard to design and standard of construction. In the Woodwork Section two model railway stations have been built, and work is now in hand on a model aerodrome, all models being fitted with electric light. Stamp Collecting has been added to the programme. Club roll: 9. *Secretary:* M. Anderson, 36, Breich Terrace, West Calder.

Northampton M.C.—Interesting Meccano models were built for entry in a "Lorry" Contest, in which competition was keen, two members tying for first place. A special meeting at the home of Mr. G. L. D. Hodges, Leader, was devoted to Games. Further matches in the Darts League were played, and the first round of the Football "Knockout" Contest also was completed. Club roll: 9. *Secretary:* E. F. Billingham, 187, Birchfield Road East, Northampton.

Exeter M.C.—Models built recently have included a realistic aircraft carrier, a large church, two liners and a destroyer. The Hornby Train Section has been exceptionally busy with train running on a record scale. The football teams have maintained their good record of matches played, in spite of the bad weather conditions, and players enjoy their games whether they win or lose. Club roll: 80. *Secretary:* J. T. H. Fenwick, 45, Calthorpe Road, Exeter.

Cold Harbour M.C.—Model-building has been enthusiastically carried out, and occasionally evenings have been devoted to Hornby Train operation. An interesting evening was devoted to a Talk by Captain



A group of members of the Middlesbrough M.C., which was affiliated in February 1926. Mr. J. Byers, Leader, is seated in the centre; secretary, Mr. G. Brockhurst. The membership has recently been almost doubled, and with excellent attendances, meetings have been greatly enjoyed. Regular club work is well balanced with social activities, recent events including a visit to the local Fire Station and Social Evenings in which the parents of members have joined.

Heath on "*Cine-photography*," during which he ran through a few of his own films, one of which showed the local blacksmith at work. Club roll: 17. *Secretary:* R. S. Hill, Anstie Farm, Cold Harbour, nr. Dorking.

Plymouth M.C.—The Annual Exhibition was a great success, much interest being shown in the large array of Meccano models, including the well-known super model transporter bridge, a six-wheeled, independently-sprung lorry, a wind pump, a log cutting machine and a steam tractor. An extensive layout was worked by the Hornby Section, and models were displayed by the Ship and Aeroplane Sections. A Coach Modelling Section has been formed. There was a record attendance at a recent meeting The newly-opened Library is very popular with members. The "*Gear Box*," the club's magazine, maintains a high standard, giving club news and many fine articles of general interest every month. Club roll: 86. *Secretary:* A. E. Miller, 21, Hamilton Gardens, Mutley, Plymouth.

Hornsea M.C.—The first of a series of short talks by younger members dealt with "*Aeroplanes*," and was a very good effort. Other Talks have been given on "*Cinemas*," "*Railways*" and "*Ships*." Games Evenings have been held, and a Film Show given. A satisfactory cash balance was reported at a recent committee meeting. Club roll: 14. *Secretary:* P. Richardson, "Summerleigh," Esplanade North, Hornsea.

Barnard Castle School M.C.—Members have been engaged in building scenery and accessories for the club's Hornby Railway, and have laid down a new track on which regular train services are now being run. Special interest was taken in a Hornby-Dublo Train Set brought along by a member. Model-building and other activities are now being followed with great vigour. Club roll: 17. *Secretary:* A. Coates, The School, Barnard Castle, Co. Durham.

Islandmagee M.C.—A special Social Evening was organised to celebrate the first birthday of the club and the associated Branch. Proceedings began with a meeting, at which greetings from Headquarters and from the Exeter M.C. were read, a very satisfactory report of the year's working was given, and officers were elected. Tea followed, after which Merit Medallions won by members were presented. Games were then played. Two new members have been enrolled. The club's finances are sound, and a Hornby-Dublo Electric Train Set has been purchased for the use of the associated Branch. Club roll: 20. *Secretary:* S. McCready, "Hillmount," Islandmagee, Co. Antrim.

St. Oswalds M.C.—Outstanding models have included a streamlined train and very realistic "Simplicity" models. On a Stamp Evening an interesting discussion developed as to why people collected stamps. A Talk has been given on "*Bridges*." Lexicon was played on a Games Evening. Arrangements for the future including a Debate on "*Sea v. Air Transport*," and the Exhibition. Club roll: 25. *Secretary:* J. F. Jaques, "El Molino," 5, Ingram Road, Thornton Heath, Surrey.

Sloane School M.C.—Intensive model-building is in hand in preparation for the forthcoming Exhibition, and the club stock of Meccano is rapidly disappearing as models are constructed. The new magazine Library is very popular. A Hornby Train Section is to be started soon, and several Lectures are being arranged. Club roll: 25. *Secretary:* D. A. Clack, 24, Moylon Road, Lillie Road, London W.6.

St. Giles' Schoolboy (Edinburgh) M.C.—The club is now the largest in Scotland. The clubrooms are open every evening and on three afternoons a week, and almost every hobby is provided for. A special room set apart for model-building is well equipped and there is a large Model Railway Section. The club's gymnasium is a special attraction. Club roll: 400. *Leader:* R. Croall, 19, South St. David Street, Edinburgh 2.

Folkestone M.C.—Two new members have been enrolled. Further Meccano models have been constructed for use on the model railway, in the goods yards of which Meccano cranes are already working very well. The two club yachts are taken regularly to a park lake for sailing practice and races. Club roll: 9. *Secretary:* W. F. Cotter, 52, Hill Road, Folkestone.

Barking M.C.—The 2nd Birthday Meeting took the form of an enjoyable "Camp Fire." Meccano models built are criticised by the Leader. An interesting steamship model incorporated a number of Aeroplane Constructor parts. A Woodwork Evening was devoted to the making of a gauge 00 railway station. Club roll: 31. *Secretary:* F. K. Whitehead, 60, Devon Road, Barking.

HOLLAND

Maastricht M.C.—Weekly meetings have been held, and Meccano models have been built for entry in "*M.M.*" Contests. The stock of Meccano parts has been increased, necessitating the construction of a new storage box. A number of model ships and a model glider are under construction. A Junior Section has been formed, and is expected to be very popular. At the first meeting of the Section, the Leader gave a short Lecture on the Meccano Guild and the Maastricht Club, followed by a Lantern Lecture on "*Traffic through the Ages*." The first issue of the club's Magazine is very attractive. Club roll: 14. *Secretary:* Fr. Nelissen, Volksplein 13, Maastricht.

SOUTH AFRICA

Malvern M.C.—A Moonlight Hike proved very exciting, as it involved a Treasure Hunt, which ended in a very welcome supper of cocoa and biscuits. A Mock Election was very entertaining. Games Evenings have been held, and a party has been given for children of the Epworth Homes. Club roll: 35. *Secretary:* Miss M. Morrison, 462, Jules Street, Malvern, Johannesburg.

How the Great Central Reached London

A Railway Event of 40 Years Ago

IT is 40 years this month since the opening of the last main line to enter London, that of the former Great Central Railway, which since 1923 has formed part of the L.N.E.R. As the youngest British main trunk route its story is of special interest, for the proposal to build it aroused a great deal of opposition from the established railways with main lines to the north from Euston, St. Pancras and King's Cross respectively. There were in addition features in its policy as a newcomer that contributed a great deal towards the general improvement in running and in the accommodation provided on express trains that came in the early years of this century. "Every express train vestibuled, with buffet car attached," ran the Great Central slogan, and some very fast services were put on as soon as the newly-made line had settled sufficiently to allow high-speed running. Naturally the older lines had to follow suit.

Until 1897 the Great Central was known as the Manchester, Sheffield and Lincolnshire Railway. Like the former Midland Railway, which had made its way into the Metropolis 30 years earlier, it was an important provincial system that had developed by a series of amalgamations, and its sphere of activity was well indicated by its name. For a share of the traffic between London and the districts it served it had been associated first with the London and North Western, and then with the Great Northern Railway. It also had been in negotiation with the Midland Railway, and its tactics generally in connection with other lines won for it the nickname of the "Railway Flirt."

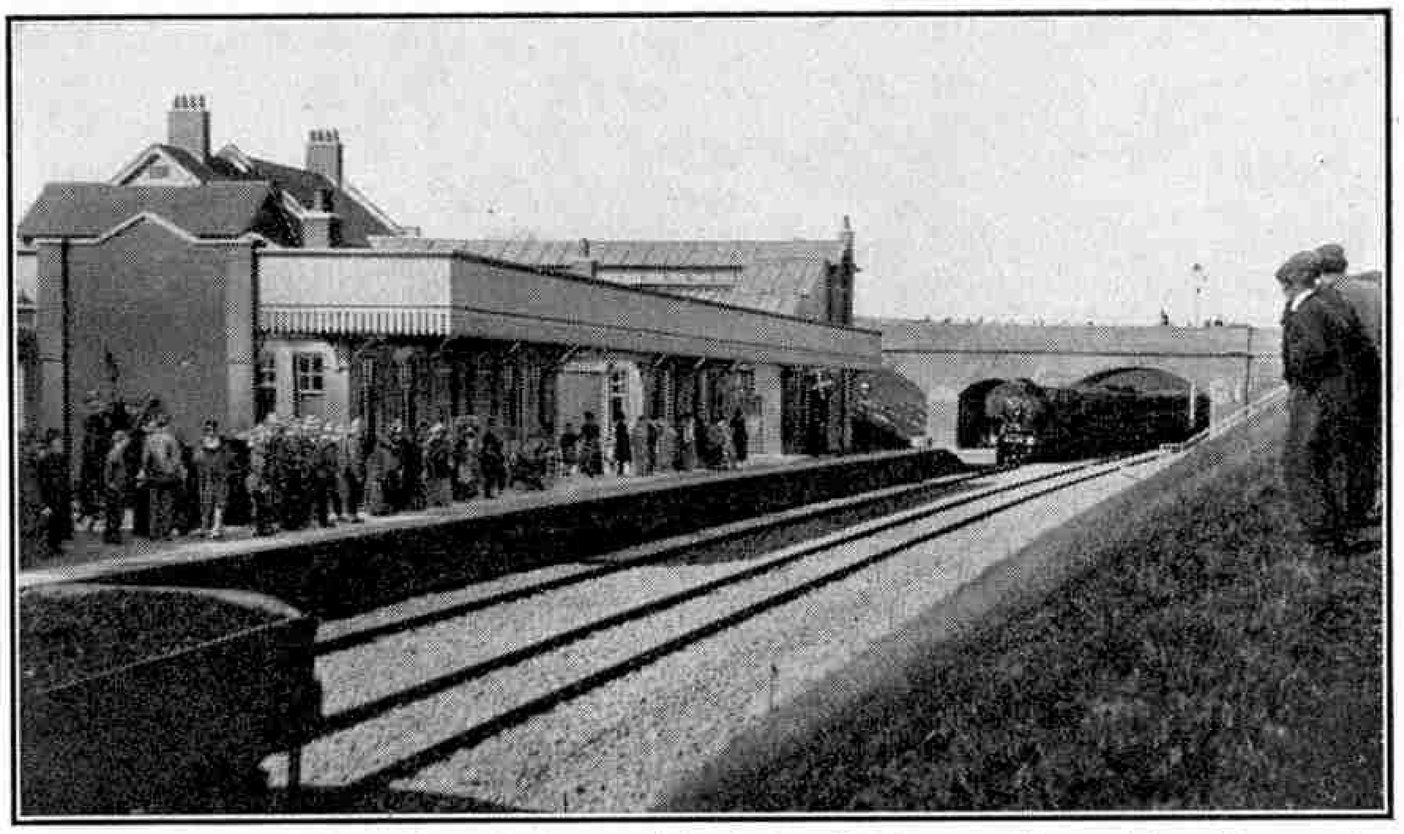
Quite early it had formed part of an alliance inspired by the L.N.W.R. with the object of preventing encroachment by the Great Northern on the Euston monopoly of traffic between London and the North. This alliance was often known as the "Euston Square Confederacy." Very soon however "the Sheffield" and the G.N.R. reached an agreement for the working of traffic, and the Manchester service developed by them to and from King's Cross via Retford commenced in 1857. This had the reputation of being one of the finest of its time in Europe. In spite of the longer route, it competed strongly with the North Western service from Euston. The quickest service ever in force between King's Cross and Manchester took 4 hr. 15 min. by the 2 p.m. expresses in each direction, a timing that was instituted in 1884.

Then came the proposal for a M. S. and L. line from Sheffield to Chesterfield, but powers were refused by Parliament. Next a line running as far as Annesley, south of Nottingham, was proposed, and Parliamentary sanction was obtained for its construction. Finally came the bold proposal to extend the line southwards from Annesley, and ultimately to reach London. In spite of opposition from the G.N.R. and other companies the Bill for this line was ultimately passed.

It is interesting to note that this extension was only part of a grandiose scheme for linking Manchester with the Continent by way of the proposed Channel Tunnel. At the same time as "the Sheffield" was taking steps to break a new trail to the south, the Metropolitan Railway, which commenced as a purely London concern, was gradually being extended northward. Both were under the Chairmanship of Sir Edward Watkin, who was connected with the London Chatham and Dover line and also with the Channel Tunnel Company!

The first arrangement was that Great Central trains were to use Metropolitan tracks between Quainton Road Junction, north of Aylesbury, and Harrow, but between Harrow and the new Marylebone terminus in London the Great Central lines were separate, although laid alongside the Metropolitan tracks for some distance. This joint working was liable to cause delay at times to the trains of both companies, and at a later date an alternative route was afforded by means of the Great Western and Great Central Joint Railway via High Wycombe. The Great Central, therefore, had ultimately two routes between London and the North, neither of which was its own property exclusively.

The formal opening of the new line via Quainton Road Junction and Harrow took place on 9th March 1899. On that date Great Central 4–4–0 locomotive No. 861, decorated for the occasion, left Marylebone with the first official train. On the same date similar locomotives, Nos. 268, 269 and 270, worked up trains to London, bringing visitors for the opening ceremony. It is in this connection that the photograph reproduced on this page is of such interest. This was discovered in a private collection by Mr. E. R. King of Brackley, Northamptonshire, and shows a decorated Great Central engine running into the station at Brackley.



Brackley Station 40 years ago. The train shown arriving is thought to be one of the specials run in connection with the opening of the Great Central route from the north to London. The circumstances are explained on this page. Photograph reproduced by courtesy of Mr. E. R. King, Brackley.

No definite details regarding the photograph are available, but through the collaboration of the L.N.E.R. it has been discovered that in referring to the opening the "*Nottingham Railway Guardian*" of 10th March 1899 reported that "at Brackley the occasion seemed to be commemorated by a public holiday, the station premises were gaily decorated, and the local band and fire brigade were on parade on the platform." From examination of the photograph, it seems certain that this is the occasion depicted. The members of the fire brigade can be discerned on the platform near the corner of the station building. It is evident, too, that most of the spectators are keenly interested in the arriving train, which may therefore have been the special that is known to have called there to pick up guests proceeding to the opening. Another print discovered along with the one reproduced on this page gives a general view of the people of Brackley assembled in the station yard, and shows that the opening of the line was regarded as an event of considerable importance!

Regular train services between Marylebone and the north commenced on 15th March 1899. Curiously enough at first, as the Metropolitan section used by Great Central trains was not then jointly owned, no trains to and from Marylebone served any point nearer London than Calvert, the first station on the new line after Quainton Road, with the exception of a few that stopped at Harrow and Aylesbury. Marylebone thus had no suburban traffic, and all trains were virtually expresses, although their timing was somewhat on the easy side until the new line had become suitable for fast travelling. The 103 miles between Marylebone and Leicester were soon scheduled to be covered in 105 minutes, however, an average speed of practically 60 m.p.h.

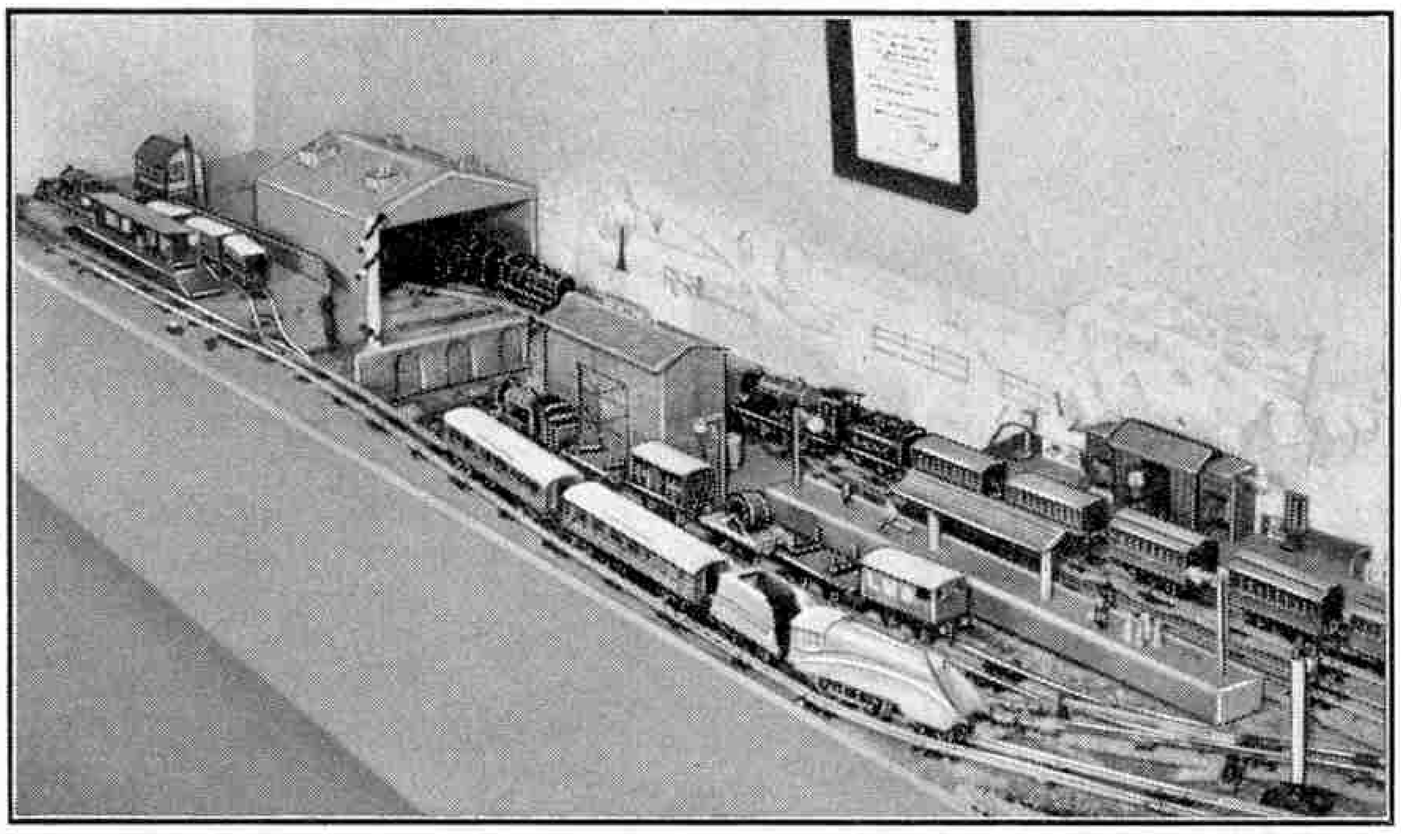
After matters had settled down, an important development was the inauguration of the famous "*Sheffield Special*," which was later extended to Manchester, and from which the present-day 3.20 p.m. down express has developed. This at first was booked non-stop to Sheffield, 164¾ miles in 3 hours, but one of the up trains made the same timing with stops at Nottingham and Leicester thrown in! In each case one minute only was allowed for the stop so that really smart station work was demanded.

Train Control on a Branch Layout

Good Running at Northampton

THE track of a live Branch of the H.R.C. is continually being extended by the addition of new tracks or scenery, and traffic is speeded up and made more intensive as new material is brought into use. This has been the case with the Northampton Branch, No. 284, which was incorporated with the H.R.C. on 2nd March 1935. In less than four years its original track of 40 ft. has grown into one with a length of 250 ft. This is housed in a room 15 ft. square, and is arranged on boards along three walls, with an extension in the centre, so that plenty of room is left for Branch members to carry out the necessary operations at the five stations when a track meeting is in progress.

A special feature of the layout is that it has been designed to allow the use of both L.N.E.R. and L.M.S. rolling stock, thus meeting the wishes of members themselves, whose interests are divided between these two lines. It does not attempt to reproduce any section of real railway, however. The main run is from "Euston" to "Liverpool" through "Stafford," and from "Stafford" there is a special line to "York," which for reasons of convenience is near "Euston," but is readily distinguished from it by being at a level 3 inches higher. The fifth station on the layout is "Kenilworth," to which a branch lies from "Stafford." The main line from "Euston" to "Liverpool" runs between "Kenilworth" station and an effective miniature building to represent Kenilworth Castle. This is a departure from real railway geography, but one that is allowable in the special circumstances.



"Euston" station on the layout of the Northampton Branch, No. 284. In the foreground is the line from "York," on which is an express hauled by the miniature streamlined engine "Silver Link."

On entering the Branch room the line is seen to be effective in appearance and well laid out for operations. The boards have a thin coating of green paint, which gives the correct general colour to the surroundings of the track, and the rails are laid on strips of "Linovent," which consists of a layer of cork fixed to a base and has the effect of reducing the noise of the trains. The "Linovent" is brown in colour, and strips of material of a different shade of brown are used for roads, which are lined with hedges and fences. Miniature telegraph poles are correctly placed in position, and the general effect is completed by a very simple but well-designed scenic background that was painted by one of the members. All the stations are lighted electrically and at a recent Branch Exhibition there were 75 lights in use at once.

The services are run by at least six members, one at each of the five stations and one at the control board. The latter occupies a space between the boards carrying the "Stafford" or "Kenilworth" stations, which project from one wall, into the centre of the room, a lift bridge carrying the track between these two places. The operator at the control board has in front of him five push buttons and five small lamps, one of each for each of the five stations and all labelled with the correct name. Pressing a button rings a bell at the appropriate station, alongside which is a push button by means of which the corresponding lamp on the control board can be lighted up. A simple code system enables the controller to give instructions by means of bell signals, and the members in charge of the stations to acknowledge these and to reply by switching on lights. Operations therefore are carried on without speaking, the need for calling from one station to another, an impossibility in real railway life, being completely avoided.

Every movement is made in accordance with the timetable, a copy of which is in front of the member acting as controller. The services include the running of several goods trains, two local passenger trains, and a number of express trains. The engines in use include a Hornby E320 "*Flying Scotsman*," which is used for fast Pullman Expresses, together with Hornby L.M.S. Tank Locomotives that are employed in hauling freight traffic. In addition there is a model of the streamlined L.N.E.R. engine "*Silver Link*" that was constructed by a member of the Branch.

In order to give readers a comprehensive idea of the actual layout we will imagine for a moment that we have been reduced to the size of the miniature Hornby Passengers, and that we are waiting on the platform of "Euston." The bell rings a signal from the operator at the control board and our train slowly backs down to the buffers, in readiness for its journey. There is a moment's wait, and then the whistle blows and the train glides slowly out of the station.

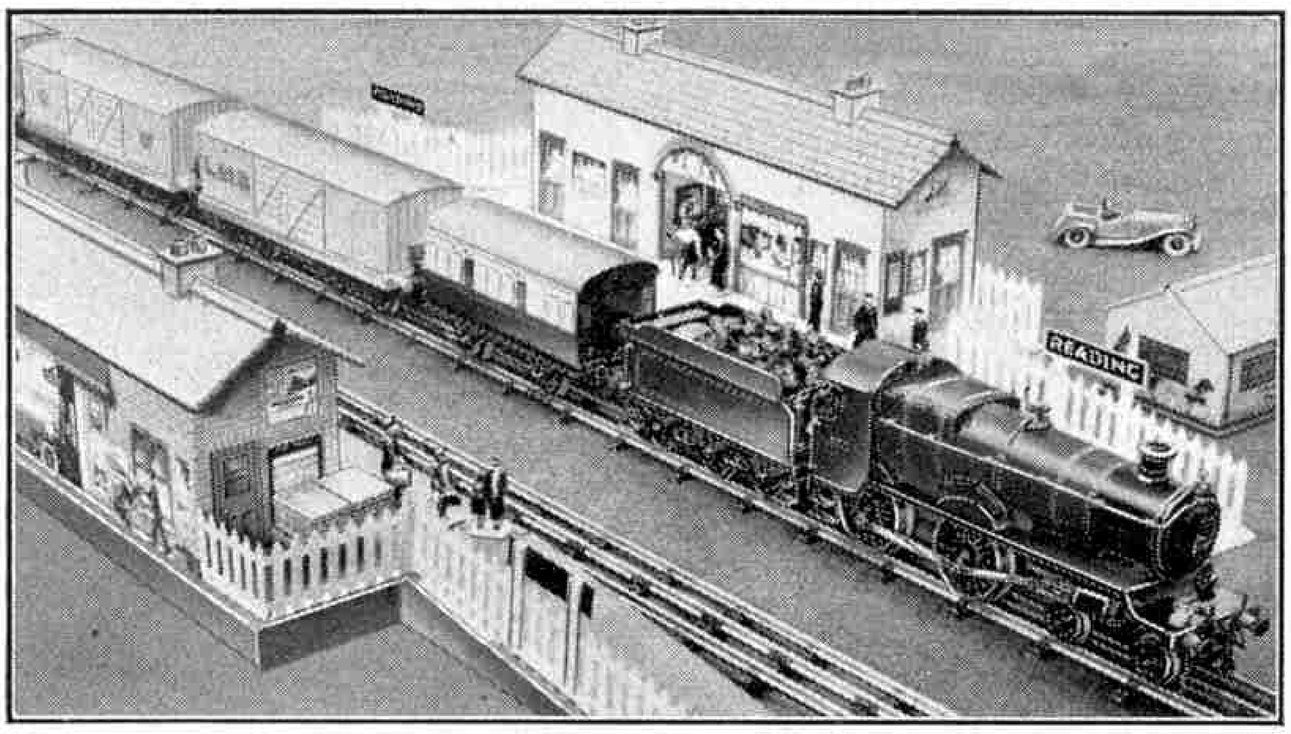
It is not long before we are travelling at full speed. We traverse a crossing and soon Kenilworth Castle comes into view. Passing "Kenilworth" on our right we are soon rounding the sweeping curve to "Stafford" where we wait until an express from "York" arrives. Then after a short journey through country we steam into "Liverpool" to complete a most interesting run.

Unusual Train Working

Hornby Rolling Stock for "Specials"

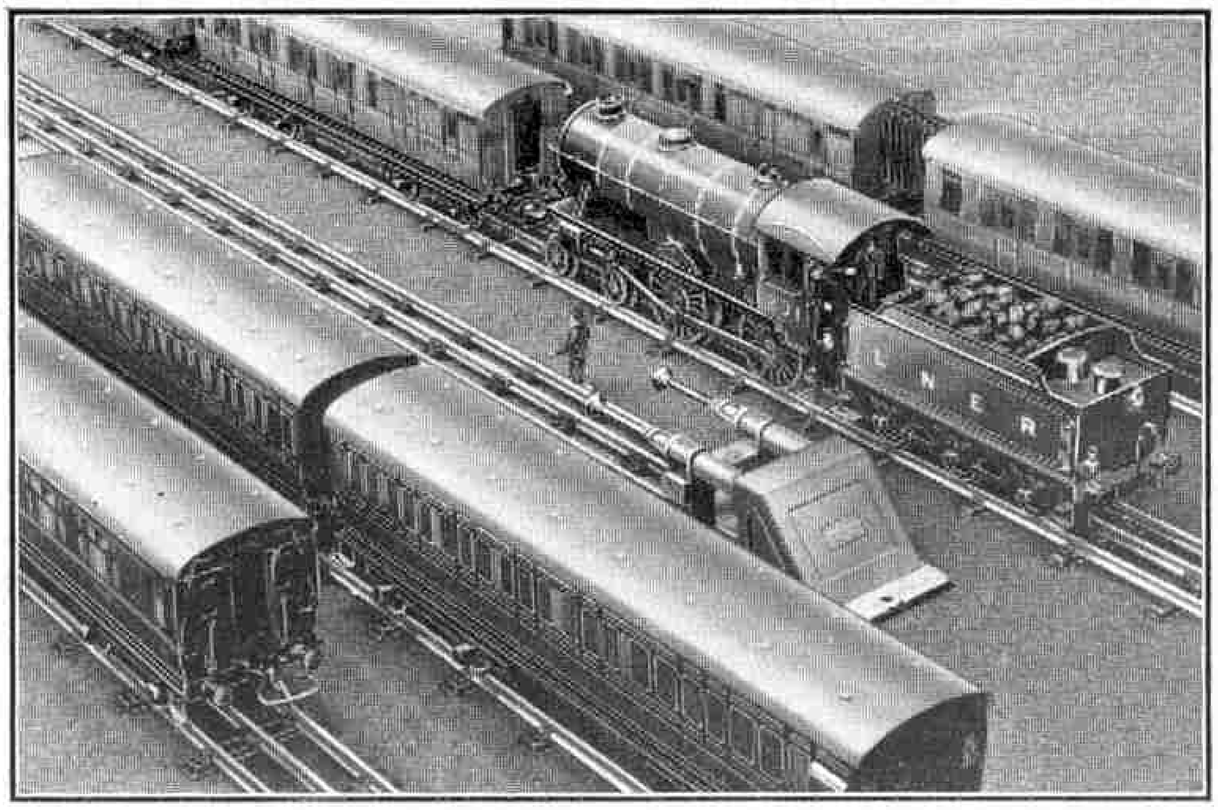
THE articles that have appeared on these pages during the past few months have dealt with the make-up and running of trains of various kinds. For instance, that of last month was concerned with passenger and goods trains of regular services, and we now complete the series by describing how to use standard rolling stock in the making up of trains of a special or unusual character.

Certain kinds of special passenger trains do not differ greatly in composition or appearance from the regular services. Thus a long distance special run in connection with a football match would look much like any other express, but the locomotive almost certainly would carry a board at the front bearing the special number allotted to the train for identification purposes. In addition, it is possible that some special display incorporating the club colours of the team whose supporters are travelling may be made on the locomotive in charge of a special train of this kind.



A "Stores Train" on a Hornby Railway. The composition and running of one of these trains is dealt with in this article.

On a Hornby Railway a miniature "football special" can be assembled either of standard No. 2 Corridor Coaches or No. 2 Saloon Coaches. The latter are perhaps preferable, for they represent the type of vehicle commonly used on such work, particularly if catering arrangements on the train are extensive, but it would be quite in order to use both types of vehicle in the same train. Each type is provided with the standard Corridor Connections, so that there is no difficulty in joining them in a train and this scheme is favoured by many Hornby Railway owners who want their special trains to look really "special." The Saloon Coaches are used to represent restaurant cars in the centre of a train made up otherwise of No. 2 Corridor Coaches, a method of assembly that gives a well-balanced appearance. A further advantage is that putting the restaurant vehicles in the centre of the train makes it unnecessary to carry out any re-formation for the return journey.



Carriage sidings in miniature. A train of "empty" stock has just arrived in charge of "The Bramham Moor." The headlamp indication should be noted.

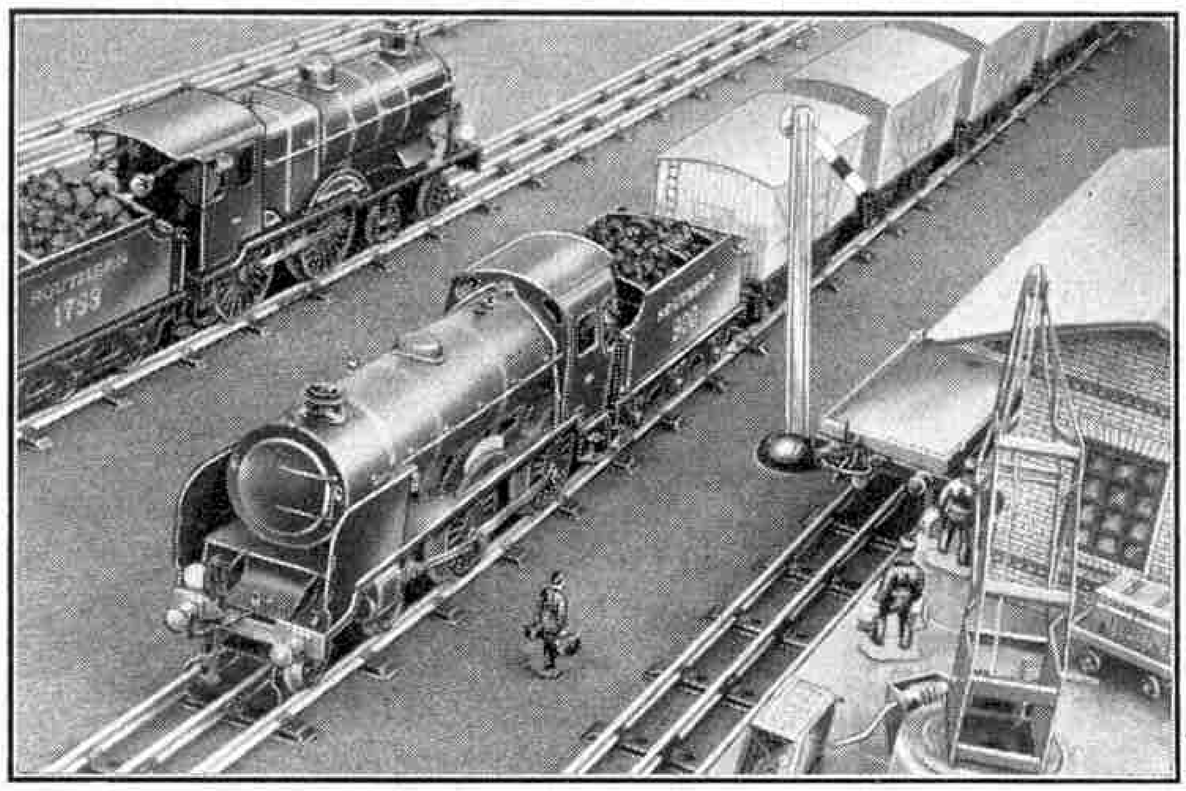
It is not difficult to fix up a small oblong piece of thin card to represent the board on which the special number allotted to the train is marked. A scheme that gives realistic results is to cut a few printed numbers of suitable size from the pages of an old paper or magazine, and to stick these down on the "board." This is best attached by piercing two fine holes in its top edge and passing through these a loop of cotton or fine wire by means of which it can be hung from the top lamp bracket on the front of the engine.

Special decorations can take almost any form. Frequently a large board or poster bearing the name of the club concerned, perhaps with some slogan, is carried on the engine front; and further decoration is arranged by means of streamers of suitable colours carried along the handrails. Those readers who wish to practice this sort of locomotive decoration will be able to prepare a suitable poster, taking details either from one they have actually seen or by drawing on their imagination. For further decoration one or two coloured threads can be fastened to the handrails of a Hornby Locomotive. These should be tied securely at both ends, in order to prevent them from being caught up in the moving parts.

Theatrical specials also can be worked easily on a Hornby Railway. These are run to carry theatrical companies and their gear and properties from one town to another, and therefore are most often seen on Sundays. They may consist of one or more passenger coaches for the members of the company, and a selection of other vehicles according to the nature of the properties to be conveyed. Such trains often travel by curious routes, and partly for this reason they may be hauled by unusual locomotives.

On a Hornby Railway a realistic train of this kind can be made up of a Brake Composite No. 2 Corridor Coach to

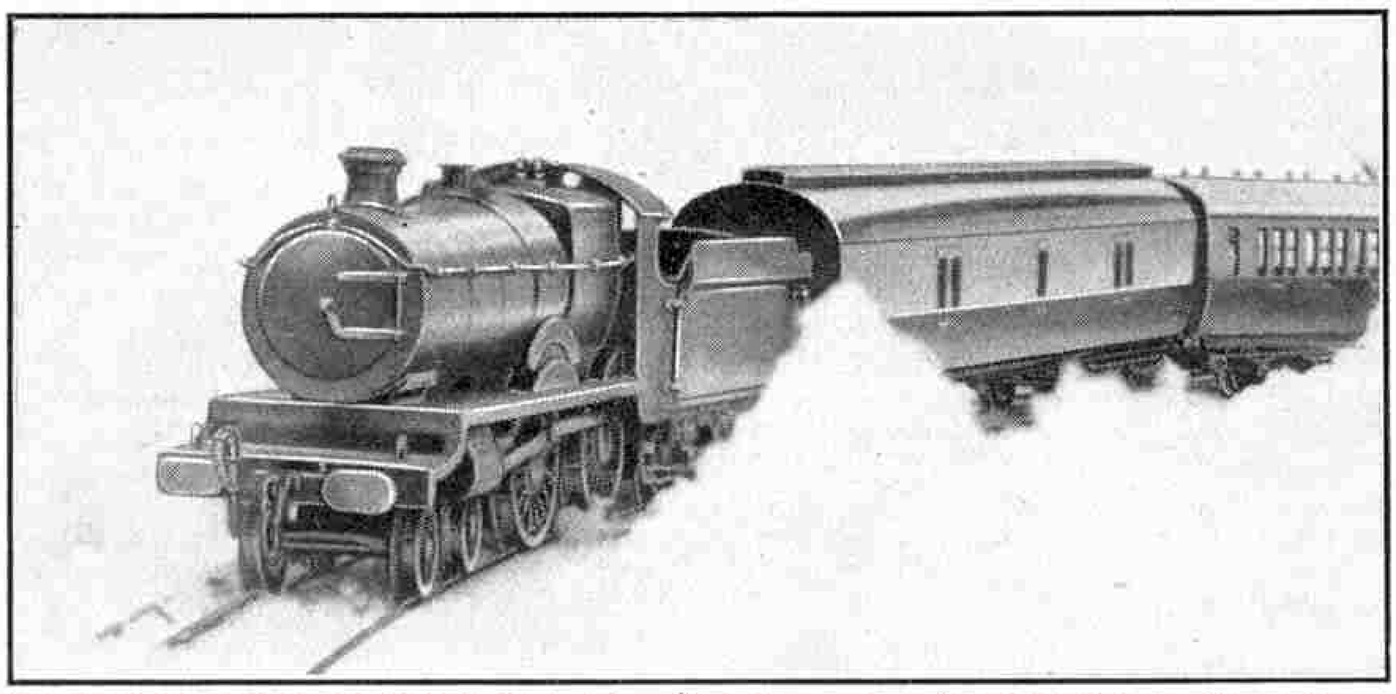
provide accommodation for the passengers and their luggage. If the "company" is supposed to be a large one, an additional Corridor Coach can be attached. Then one or two No. 2 Luggage Vans can be run in the train, the idea being that they are used for conveying stage scenery. Special vehicles adapted for the purpose are employed in actual practice, and the Hornby No. 2 Luggage Van is probably the best substitute that is available in the Series. The train can be completed by a Flat Truck on which various items may be placed underneath a Hornby Wagon Tarpaulin to protect them from the "weather." Sometimes the vehicle used for conveying the properties of a particular production are specially labelled with its name, and here again the Hornby Railway owner can give full play to his imagination.



A "special fitted" freight train on a Hornby Railway. The engine is "Eton," the famous Hornby "Schools" class model.

From time to time readers may have seen stopping at their local station a strange-looking train made up of a miscellaneous collection of vans. They may have observed that as a rule a great deal of loading and unloading of all sorts of items takes place, and probably will have wondered what it is all about. These trains are known as stores trains, and they are run from the main supply depots over different parts of the line in order to keep the stations and other establishments supplied with the various items needed in their working. The goods they convey include parts required for certain repair jobs, implements of various kinds and a variety of consumable stores.

The running of such a train now and again on a Hornby Railway will add to the interest of operations. Its make-up can be of quite an odd-and-end character according to the vehicles available. Possibly one or two old vans not now in regular traffic can be allocated to stores train duty. Here again, the No. 2 Luggage Van is useful, for its wide double doors provide for easy loading and unloading, and any other oddments of rolling stock may be used for the purpose. The Guard's Van is necessary to complete the train and adds to the variety of stock employed.



Model railway working under difficulties! A view on the outdoor system of Mr. H. C. Raindle of Ewell, Surrey, showing "County of Bedford" running through the snow.

Almost any locomotive within reason can be used for a miniature stores train. A Hornby engine that is due for "shops," or one that is being run in again after "general overhaul" can be employed quite well, and the actual type used may range from the large No. 3 express locomotive to the smaller No. 1 or No. 0 mixed traffic designs.

The running of empty passenger stock is a regular part of railway operation that the miniature operator should reproduce on his line. This includes hauling of empty trains from terminal or other stations to and from the carriage depots or sidings where they are stabled and serviced, as well as moving a train empty from one point to another in order to provide for some special working from the latter place. Miniature rolling stock looks the same whether it is supposed to be empty or full of passengers, but when running empty trains it is important to observe the correct headlamp indication for this work. This varies slightly according to the railway concerned and the district in which the train is run. The British Standard Headlamp Code covers almost all cases however, and can be followed perfectly on Hornby Railways, as lamp brackets and detachable headlamps are provided for the majority of Hornby Locomotives. It requires a lamp to be placed in front of the chimney of the locomotive and another over the right-hand buffer of the engine. If the engine is working tender or bunker foremost, the upper lamp bracket at the rear corresponds to that in front of the chimney when the engine is going forward.

What are known as stock trains will provide further variety for the Hornby Train owner interested in "specials." These trains consist of vehicles that are being despatched to the carriage works for overhauling and are frequently made up to considerable length. Their running as a variation from the regular programme can be made an interesting feature of the operations carried out on a Hornby Railway.

The special working of freight trains is frequently necessary owing to the necessity for conveying traffic of unusual character. The best wagon for dealing with bulky or out-of-gauge loads in the Hornby Series is the Trolley Wagon, but loads of rare kinds can also be dealt with according to their nature by one or other of the remaining vehicles in the Series. Readers who are keen on reproducing this branch of railway working will find inspiration in the 1938–9 "Hornby Book of Trains" in which indeed both regular and unusual freight activities of our railways are fully described. Copies of the book can be obtained from any Meccano dealer, price 3d., or from Headquarters for 4½d., including postage.

Special seasonal trains of certain kinds provide good fun. Hornby Refrigerator, Meat and Banana Vans and the Insulated and Ventilated Containers of G.W.R. and S.R. types respectively are most useful for such trains.

WOLVERHAMPTON SECONDARY SCHOOL.—The operation of railway layouts, both clockwork and electric, attracted much interest at an Open Meeting. Some 40 Meccano models also were shown, the subjects including aircraft, cranes, lifts, and steam engines. A prize for the best model was won by one of the youngest members with a fine aeroplane. Secretary: G. Tredwell, 11, Sherwood Street, Wolverhampton.

KIDDERMINSTER.—This Branch has greatly increased its membership and activities since its foundation in 1929. Although model railway working is still the chief interest, many other hobbies are provided for, and Social Evenings, Debates and Film Shows are held regularly. The secretary would be pleased to hear from any local H.R.C. enthusiasts who would like to join the Branch. Secretary: S. Potts, Railway House, Prospect Hill, Kidderminster.

PURLEY COUNTY SCHOOL.—Track Meetings have been held, and interesting work carried out on the Branch layout. A Discussion Evening was greatly enjoyed. A number of Lantern Lectures are to be given. Secretary: D. Hardwick, "Woodcroft," Beech Drive, Kingswood, Surrey.

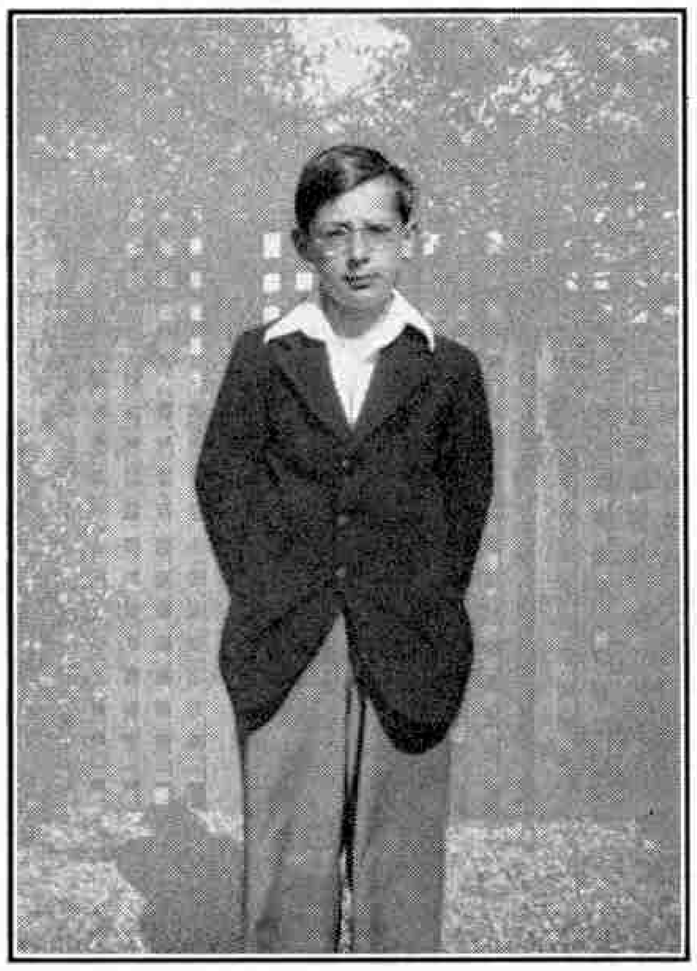
ST. OSWALDS.—Regular meetings have been held, and on Track Evenings very successful train running has been enjoyed. Two-minute talks on railway subjects have been popular. Lantern Lectures have dealt with *"The History of the Main Line Railways,"* and *"The Southern Railway."* At Games Evening billiards, cards, and progressive games have been played, and a Spelling Bee has been held. Preparations are being made for the Exhibition on 1st April. Secretary: R. K. Hurden, 62, Hepworth Road, London S.W.16.

HORNSEA.—A new track has been laid down, and on Hornby Railway Evenings a variety of passenger and goods trains have been run to timetable. On one of these evenings it was supposed that heavy snowfalls held up trains, and the Branch snow plough was put into service with excellent results. The running of "Winter Sports" specials provided another splendid track meeting. Leader, Mr. R. W. Shooter, "The Gowans," Cliff Road, Hornsea.

COPNOR (PORTSMOUTH).—The chief feature of track meetings has been the trial of various layouts of widely differing designs, for each of which special timetables were worked out. A Lecture on *"Railways"* proved very informative. Secretary: E. A. Wheeler, 51, Wallace Road, Copnor, Portsmouth.

WATERLOO (DUBLIN).—Winter timetables have recently been in force on the "Kent and East Sussex Railways" operated by this Branch, and traffic working has been quiet. Two bogie locomotives and six four-wheelers are in service. Bogie carriages are used for the principal passenger trains. Secretary: S. B. Carse, 38, Oakley Road, Ranelagh, Dublin.

WEST HADDON.—In addition to the L.M.S. and L.N.E.R. sections of this Branch, there is now a third, "Associated Industries," or "A.I.," the work of which is to provide scenic effects for the layout, including coal mines and factories, and to supply goods for transport by rail. Extensive alterations are to be carried out on both the L.M.S. and L.N.E.R. layouts, and it is hoped to be able to re-lay the track at "elbow height." An instructive visit was paid to a L.M.S. Film Show at Rugby. Members ventured on an early cycle ride, but enjoyment was rather marred for the last 10 miles by heavy rain. Secretary: D. G. Bush, "Stonelea," West Haddon, Rugby.



J. H. Pursey, secretary of the Ulverston H.R.C. Branch No. 355, which was incorporated in September 1938, Chairman, Mr. H. S. Pursey. The Branch has a large track laid on trestles, part of which is in the open, and semaphore and colour light signalling systems are fitted. There are several passenger stations and a fine goods yard, and extensive timetable services of all classes are run.

ST. STEPHENS (SALTASH).—Good work has been put in on track building, and the final sections of the new Branch railway have been laid down. The track has been screwed down on a board, and incorporates several fine double-curved turnouts. When tested it was found to be very satisfactory. Arrangements are being made to allow it to be hoisted to the roof of the clubroom when this is required for other purposes. Some 150 ft. of steel track has been purchased, and this is being built up into an additional large layout that can be folded up against the wall. Social activities have included a dance, a variety show, and the annual New Year Social. Talks on railway topics have been given. Secretary: B. R. J. Braund, 9, Homer Park, Saltash.

ISLANDMAGEE.—Shortage of equipment curtailed model railway activities for a time, but steady progress with extensions is now being made. A Concert held recently in conjunction with the associated Meccano club was a great success, and the proceeds are to be used for the purchase of the new railway equipment required. The Fretwork Section continues to be industrious. *"The Gazette,"* the Branch Magazine, is flourishing, and copies are exchanged for the magazines of other Branches and clubs. Secretary: S. McCready, "Hillmount," Islandmagee, County Antrim.

BURY ST. EDMUNDS.—The Branch track has been enlarged and laid to a new design, chosen by vote from a number submitted by members. New timetables are being compiled. A Table Tennis Tournament and a General Knowledge Contest have been held. An interesting Lecture was given by a member on *"Express Trains of the S.R."* A Branch Magazine is to be issued quarterly. The Library is being enlarged. Secretary: T. S. West, 10, Crown Street, Bury St. Edmunds.

Proposed Branches

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this organisation should communicate with the promoters, whose names and addresses are given below.

BIRDBROOK—W. B. Woodward, Finkle Green.
BRISTOL—D. Burgess, 15, Druid Hill, Stoke Bishop.
CANTERBURY—D. A. Mills, "Belmont," Thanington Road, nr. Canterbury.
CARMARTHEN—W. R. J. Griffiths, "The Laurels," Llangunnor Road.
GUILDFORD—J. E. Colebrooke, Park End, Portsmouth Road.
HAYES—A. Drake, 101, Bourne Avenue.
HEMEL HEMPSTEAD—R. Billington, 32, Chipperfield Road, Manor Estate.
HORNCHURCH—W. M. Sweetman, 52, Herbert Road.
LAINDON—Mr. W. H. Branch, "Westmoor," Basildon Rise, Basildon Road.
NEW ZEALAND—B. Rowe, Lower Bayly Road, New Plymouth.
OXFORD—J. R. Tovell, 103, Botley Road.
PAISLEY—J. W. Craig, 91, Seedhill Road.
STROUD—D. Wigley, "Alden," King Arthur's Drive.
WHITECRAIGS—C. Ireland, 11, Torinton Avenue, Whitecraigs, Scotland.

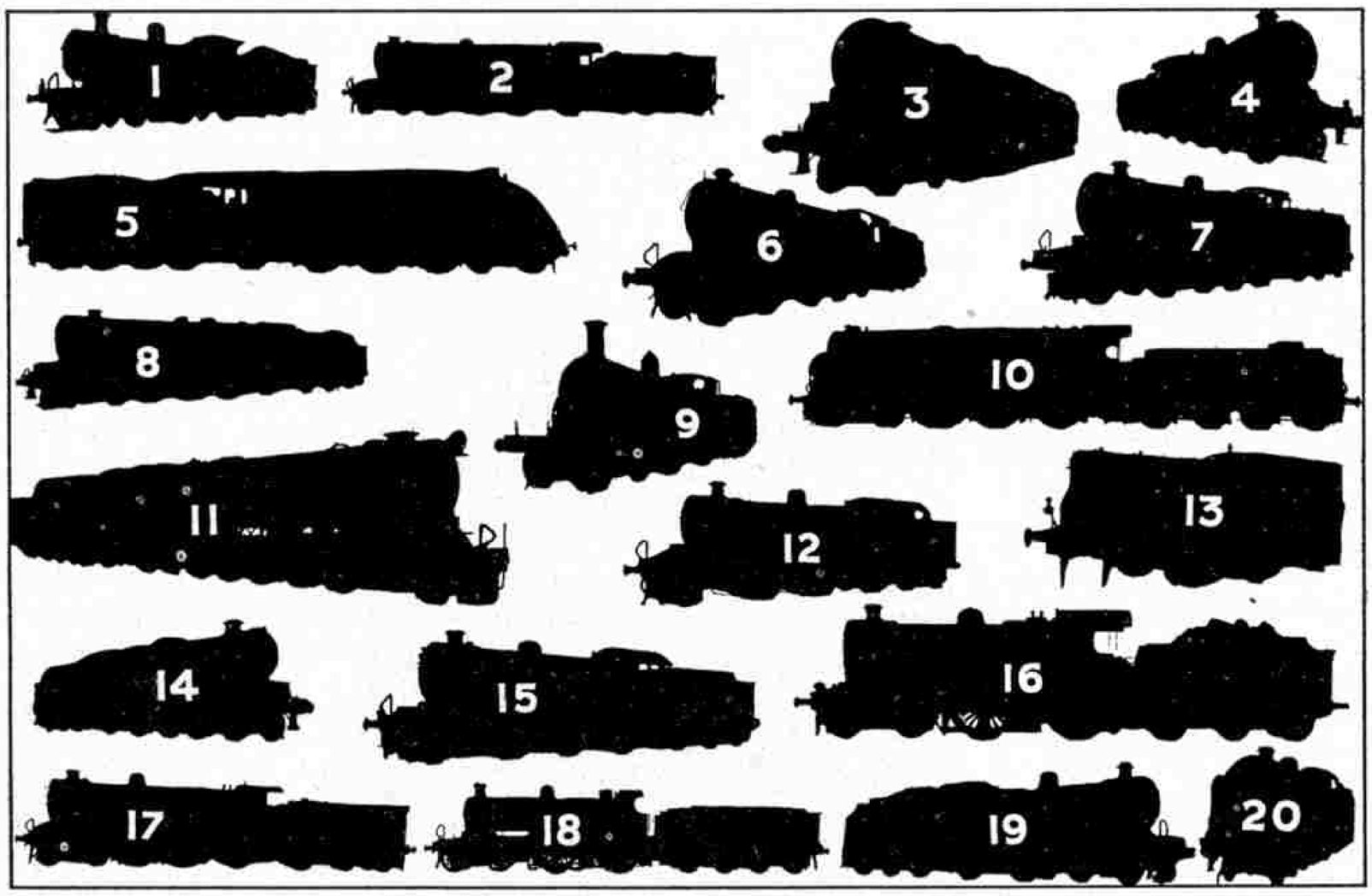
H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

LOCOMOTIVE SILHOUETTES CONTEST

This month we return to a type of contest that gives all H.R.C. members an excellent opportunity of making use of their knowledge of locomotives. In the accompanying illustration are 20 silhouettes of locomotives, and all that competitors are required to do is to decide the identity of each engine, and to state its class, wheel arrangement and owning railway company.



The silhouettes are not necessarily of British locomotives. The locomotives of other countries are represented, but in order to assist competitors in deciding which locomotives are represented they are informed that all the silhouettes have been made from illustrations of locomotives cut from issues of the *"Meccano Magazine."* Some are fairly easy to recognise. Others are likely to need a little thinking out, but the task should prove both interesting and instructive to H.R.C. enthusiasts.

When a competitor has identified all the silhouettes, or at any rate as many of them as he is able to manage, he should make a neat list of them on a sheet of paper, using one side only, together with the details asked for above, and write his name, full address and H.R.C., membership number on the back of his entry.

The contest will be divided as usual into two sections, Home and Overseas. Prizes of Hornby Train goods, or any other products of Meccano Ltd. if preferred, to the value of 21/–, 15/– and 10/6 respectively will be awarded to the three best entries submitted in each section. In the event of a tie for any prize neatness and general presentation will be taken into consideration when the final decision is made. In addition a number of Consolation prizes will be given to those members whose entries are not among the winners of the major prizes, but deserve some reward.

Envelopes containing entries must be marked *"H.R.C. Silhouettes"* in the top left-hand corner, and posted to reach headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st March. Overseas competitors must post their entries to arrive not later than 30th June. Entries received after the dates given will be disqualified.

Articles Suggestions Contest

Model railway enthusiasts are always striving to improve their layouts or planning schemes for more interesting working. We wish we could be at hand to give every H.R.C. member personal advice and assistance in his efforts to get more real fun from his model railway. Unfortunately this is impossible, but we can help enthusiasts by special articles in the *"M.M."* if we know what their problems are. We are therefore asking readers to submit six suggestions for articles dealing with points of miniature railway working on which they themselves would like further information, and which seem to them most likely to be helpful to members generally. It will be sufficient usually to suggest titles for the articles, but a few words of explantaion may be added if this is thought desirable.

The competition will be divided into the usual Home and Overseas sections, and prizes consisting of any products manufactured by Meccano Ltd. to the respective values of 21/–, 15/– and 10/6 will be awarded in each section to the three competitors whose suggestions are considered best by the judges. A number of consolation prizes also will be awarded. Competitors should bear in mind that in the case of a tie for any of the prizes, general neatness and presentation will be taken into account.

Each competitor entering for this contest must write his name, H.R.C. membership number and full postal address on the back of his entry. Envelopes containing entries should be marked *"H.R.C. March Articles Contest,"* and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st March. The closing date for competitors in the Overseas Section is 30th June.

COMPETITION RESULTS

HOME

December "Jokes Contest."—First: A. McINTYRE (30925), Paisley, Scotland. Second: F. H. GEORGE (57761), Llantrisant, Glam. Third: H. SPARKES (61079), London S.W.18. Consolation Prizes: J. NORRIS (18622), Worcester; R. G. MARTIN (61227), Bedford; J. McINTYRE (31781), Paisley, Scotland; C. DAVITT (53987), Dublin, Eire; W. WHITAKER (44565), Hornsea, E. Yorks.; E. SINTON, Aberdeen, Scotland.

December "Railway Journey Contest."—First: K. GANDY (7571), London S.W.9. Second: J. C. BUTTON (10335), Crewe, Cheshire. Third: K. E. MILBURN (26029), London E.4. Consolation Prizes: M. HOSKINS (16653), Exeter, Devon; J. F. WATTS (48256), Ilford, Essex; J. TAYLOR (10999), Wigton, Cumberland.

OVERSEAS

September "Photo Contest No. 6."—First: R. PEARSON (29199), Victoria, Australia. Second: G. C. TAYLOR (59265), New South Wales, Australia. Third: H. BENNETT (10615), Auckland, New Zealand. Consolation Prizes: E. A. HAMILTON (42512), Southland, New Zealand; P. F. SMITH (54173), Australia; A. R. BACON (38242), Bombay, India; G. PEARSON (53733), Victoria, Australia; C. DONKER (55944), Rotterdam, Holland; T. WATSON (18065), New South Wales, Australia.

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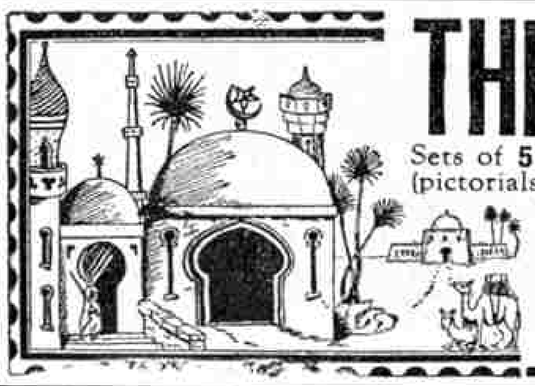

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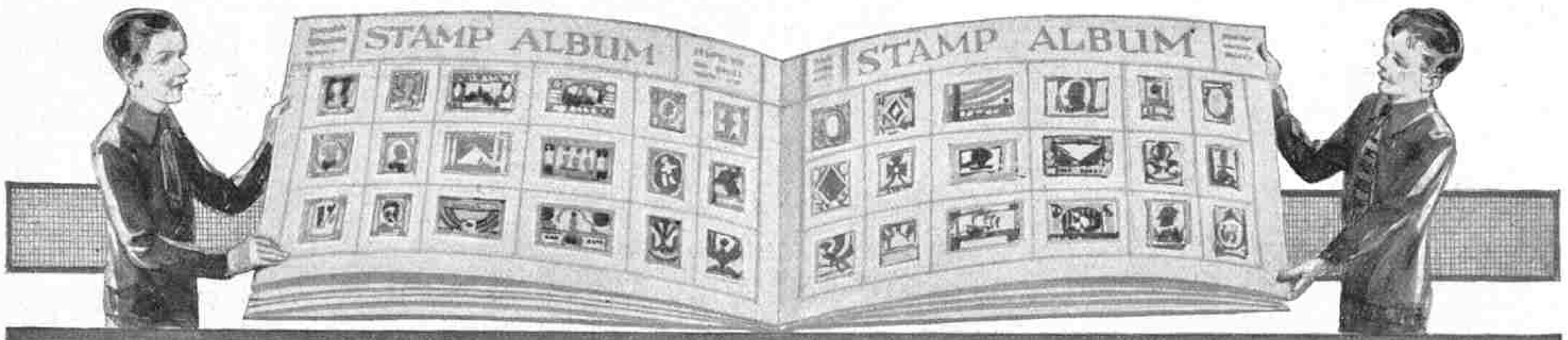


STAMP COLLECTING

NEW PICTORIALS FROM NORTH BORNEO

THE recent series from North Borneo is one of the outstanding new issues of recent months. The full set comprises 15 stamps for general postal use and five postage due labels. The 12 low values of the general set, 1c. to 50c. values, bear pictorial designs, but the $1 and $2 values show the State Shield and Crest and the $5 shows the full Coat of Arms. The postage dues show only the Crest. The pictorial designs, all of which are illustrated here, provide a most beautiful collection of glimpses of North Borneo, its native peoples and their modes of life.

North Borneo occupies only a small part of Borneo, forming 29,500 sq. miles of a total area of 284,000 sq. miles. Borneo is in fact the third largest island in the world. Holland owns two-thirds of it and the rest, comprising the States of Sarawak and Brunei in addition to North Borneo, is under British protection.

A key map of North Borneo is shown on the 8c. stamp. This shows the favourable trading position of the State in relation to the surrounding islands, and will be specially welcomed by those collectors who are seeking to build up a stamp atlas of the world. Hitherto there has been no specimen available to show this part of the Pacific Ocean.

The total population of North Borneo is roughly 300,000, rather more than 60 per cent. of which is made up of native races, principal among them being the Dusuns, who at the 1931 census totalled 117,000, the Bajaus (34,000) and the Muruts (24,000). There are so many other native races of less strength that during one year in the court at Sandakan, the principal port, no less than 32 different languages were spoken! Apart from the native races, there is a considerable Chinese population.

A typical member of the Dusun race is shown on the 3c. stamp. The men of this race are usually short but sturdy in build, and of a peaceful and industrious disposition. Farming is their principal occupation, and they grow most of the rice produced in North Borneo. The Bajaus are not so peaceful, and in earlier times they were one of the great races of North Borneo pirates. Nowadays an occasional cattle-raiding expedition seems to be the limit of their excursions outside the law, and they occupy their time mainly in fishing and agricultural work. Two Bajau natives, mounted on ponies, are shown on the 6c. value.

The Muruts are similar in type to the Dusuns, but are more primitive in their habits and customs, largely, no doubt, because they live among the hills and jungles of the interior and have only limited contact with the more advanced coast tribes. The portrait of a Murut using a blowpipe, shown on the 12c. stamp, is one of the most interesting designs of the series. It is only within recent times that the Muruts have been broken of their ancient pastime of head-hunting. The blowpipe was the hunter's most deadly weapon and it is still used in hunting game for food. It consists of a bamboo tube, about 7 ft. in length, hollowed out to give a perfectly even bore. The darts resemble straws, 7 in. in length, and are made of the heavy ribs of leaves. In the old days the tips of the darts were dipped in a poison prepared from the bark of the upas tree, and even a simple scratch was sufficient to prove fatal.

The 15c. stamp shows a warrior of the Dyak race, armed with spear and shield. The Dyaks are forest tribes who have drifted in from Sarawak, and they have proved themselves splendid forest workers in the country's great lumber industry.

The country inland from the coast is wild hilly jungle land, much of it still unexplored. A mountain range forming a backbone, as it were, runs through the State, parallel to the line of the west coast, and 30 to 50 miles inland. This range, averaging some four to six thousand feet in height, is dominated by Mount Kinabalu (13,455 ft.) which is shown on the very beautiful 50c. stamp. The summit of this mountain has 10 distinct peaks, running due east and west, a feature that is made clear in the stamp view.

Transport facilities in North Borneo are yet comparatively undeveloped except in the coastal areas, where first-class roads and railways are available. The more important inland native villages are linked to the coast by a system of well-kept bridle paths along which passes native and forest produce from the interior.

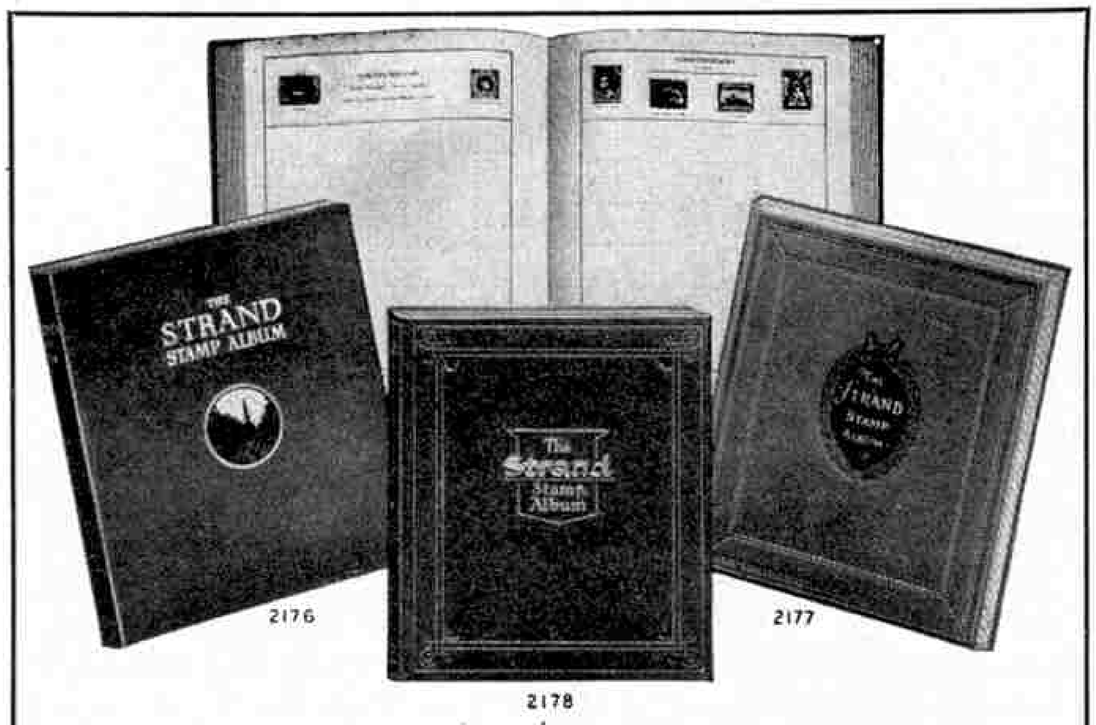
A common method of native transport is shown on the 1c. stamp. This shows a buffalo dragging a curious wheel-less frame of bamboo with a bale of goods strapped on the carrier. The buffalo is employed very widely in farming and transport work, but certain tribes have built up a big local industry in breeding ponies for this work. The Bajau tribes are among these, as shown on the 6c. stamp to which we have already referred.

Native transport along the coastal districts is largely achieved by sailing boat and canoe. A typical native sailing boat is shown on the 25c. stamp, while the 20c. value shows a lovely river scene with a native canoe in the middle distance.

The coconut palm in the foreground of the 20c. design serves to typify North Borneo's important copra industry. It is now the fourth most important item in the State's export trade, being preceded only by timber, which is the most important by a long way, rubber and tobacco.

Borneo abounds with monkeys and apes, and two interesting specimens are shown in the new stamp series, a proboscis monkey on the 4c.

(Continued on page 195)



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THE ADVERTISEMENT MANAGER
MECCANO MAGAZINE, Binns Rd., LIVERPOOL 13

Stamp Collecting—(*Continued from page 193*)

and an orang utan on the 10c. The proboscis monkey, a species found only in Borneo, derives its name from its unusually prominent nose, a feature that is excellently shown in the stamp design.

Birds, which exist in great variety, range from songsters like the crested bulbul and the magpie-robin to birds of brilliant plumage like the argus pheasant, and are represented in the series by the cockatoo shown on the 2c. stamp. The strangest of all North Borneo's birds is the megapod, which is not shown in this issue, although it was depicted on the 24c. stamp of the 1927 issue. The appearance of this bird suggests a corpulent ostrich, but its most extraordinary claim to interest is its amazing nest, the construction of which is usually the communal effort of a number of birds. One such nest, found by a Mr. John Whitehead in 1887, was "34 paces round and 5½ ft. high and must have contained several cart loads of earth, sticks and stones!"

The British North Borneo (Chartered) Company, to whom we are indebted for the loan of the stamps reproduced with this article, is to be congratulated on this attractive series of stamps, which is certain to prove popular with collectors in all parts of the world.

Stamp Gossip
and Notes on New Issues

Another Stamp War

Danzig has taken exception to a design in the Polish Independence Commemorative series issued in November last, which included symbols representing the overthrow of the Teutonic Knights. The particular stamp was the 15 gr. of the set issued for use in Polish post offices in Danzig. Danzig felt the design was offensive to its German population by implying that the country is really Polish territory. Poland refused to withdraw the design, and so Danzig has retaliated in its new series commemorating the 125th anniversary of Danzig becoming a Prussian city, by including a design depicting the defeat of the Polish King Stephen Batory by Danzig forces in 1577.

Similar stamp wars in other parts of the world have led to serious clashes. In 1900 Dominica issued a map stamp on which a substantial slice of Haiti, the neighbouring republic, was inadvertently shown as being on the Dominican side of the border. War between the two countries was averted only by the withdrawal of the stamp and a public explanation of the error by the artist who designed the stamp.

Stamp designs played a very prominent part in the Chaco boundary dispute that led to a prolonged war between Paraguay and Bolivia. The Chaco territory was almost equally divided between the two countries by a treaty in 1895, but the boundary was never clearly defined and in time it became a matter of dispute.

In 1927 Paraguay brought matters to a head by issuing a map stamp labelling the disputed area as "Chaco Paraguayo." Bolivia retaliated with a similar stamp with the territory marked "Chaco Boliviano." Further stamps of similar design appeared in both countries at intervals until 1932 by which time national feelings were running very high. Clashes between frontier guards occurred and war followed.

A minor stamp "war" recently occurred between Great Britain and Argentina, when the Falklands issued commemoratives in 1933 to celebrate the centenary of British rule. Argentina, which claims ownership of the Falkland Islands, refused to recognise the stamps and in 1936 re-inforced her claim by issuing a map stamp of South America showing the Falklands marked in the same colouring as Argentina.

"Ships on Stamps"

By Rowland H. Hill. (Stanley Gibbons Ltd. 2/6)

There are so many collectors who specialise in ship stamps, or would do so if they had a suitable guide, that this book will surely receive a warm welcome. In it the author traces the whole history of the ship, from the first primitive dug-out canoes to the modern luxury liner, with the aid of postage stamps, many of which are illustrated in the 22 full page plates that are a valuable feature of the book.

The story tells of canoes and dug-outs, galleys, dhows and junks, yachts and fishing boats. One chapter deals with some of the many famous sailing ships depicted on stamps, including the Pilgrim Fathers' "*Mayflower*," Nelson's "*Victory*," and Columbus' "*Santa Maria*." Another of equal interest is concerned with famous modern liners, including the "*Normandie*," "*Bremen*" and "*Rex*"; and yet another describes such vessels as ice-breakers, lightships, train ferries and dredgers, all of which a stamp collector can show in his album.

Proposed Travelling Stamp Exhibition

An excellent idea to stimulate public interest in philately is being discussed down Devon way. Briefly the suggestion is that the philatelic societies of Devon and Cornwall should band themselves together to organise a travelling stamp exhibition to be displayed in the principal cities and towns of the two counties next year, the centenary year of the "Penny Black." The idea is a thoroughly good one, and if it is taken up by societies in other parts of the country the year 1940 will be historic for the stamp collecting hobby.

* * * *

An interesting compliment is to be paid to Britain in the Greek set to be issued in May to commemorate the 75th anniversary of the cession of the Ionian Isles to Greece. The designs of these stamps are to include portraits of the late Queen Victoria, who gave the Islands as a wedding present to the King of Greece in 1864. This is the first occasion on which a portrait of a British sovereign has appeared on a foreign stamp.

The Canal Zone "Before and After"

The 25th anniversary of the opening of the Panama Canal is to be commemorated in August next by the issue of a series of pictorial stamps with designs that will illustrate various features of the construction of the Canal, and show the natural difficulties of the project that had to be surmounted. There will be 16 stamps for general purposes, and they will be grouped in pairs showing points of the Canal before and after its construction. In each case the two pictures will be taken from the same view point, to reveal the full nature of the engineering achievement.

The pairs and their subjects are as follows: 1c. and 2c., Balboa; 3c. and 5c., Gaillard Cut; 6c. and 7c., Bas Obispo; 8c. and 10c., Gatun Locks; 11c. and 12c., Canal Channel; 14c. and 15c., Gamboa; 18c. and 20c., Pedro Miguel Locks; 25c. and 50c., Gatun Spillway.

New Dinky Toys

During the month there will be two additions to the Dinky Toys Series of special interest at this time to every boy.

The first of these is the Mobile Anti-Aircraft Unit, Dinky Toys No. 161. This comprises a scale model of a Quick-Firing Anti-Aircraft Gun mounted on a four-wheeled mobile platform, and a Searchlight mounted on a lorry. The Anti-Aircraft Gun is in many respects one of the most remarkable models in the Series. In addition to its strikingly realistic appearance, it has a range of movements unique for a model on this tiny scale. The gun mounting can be swivelled round, or more correctly traversed, in any direction, and the gun itself is elevated or lowered by means of an actual gear operated by a small thumb-screw. For transport the gun is lowered until its barrel lies in a V-shaped rest at the front of the mobile platform. The extent of the detail on the platform, the gun mounting, and the gun itself is very notable. In short, the gun is a most fascinating toy, and its range of movements provides endless fun. The Searchlight, which is mounted on a three-ton six-wheeled lorry, also has the vertical and swivelling movements that are such an essential feature of the actual instrument.

The second novelty of the month is the 18-pounder Quick-Firing Field Gun Unit, Dinky Toys No. 162, which consists of a scale model 18-pounder Quick-Firing Field Gun, Trailer and "Light Dragon" Motor Tractor. This Set is a remarkable reproduction and gives an excellent idea of the "real thing."

Next month we hope to include an article dealing further with these splendid models, and with the operation of their prototypes in actual practice.

Gas From the Coal Mine

Much time and money is spent in hauling thousands of tons of coal from pit head to gas works in various parts of the country, and it would be much cheaper to transport the gas instead. This has been realised in Yorkshire, as a note in "*Engineering News*" on page 144 of this issue explains. This describes a scheme that has been set on foot for making gas at the pit head and transmitting it through the pipelines of a gigantic gas grid to towns and villages in the areas in which it is to be used, there supplementing supplies already received. This scheme will save money, but there would be even greater advantage in making gas directly from the coal in the seams, for this would save the immense cost and labour of working at the coal face and hauling the coal up the shafts.

The idea of making gas underground is not a new one, and indeed was suggested 50 years ago by Sir William Ramsay, the famous British chemist who discovered the rare gases now used in neon signs. It was then thought to be a wild suggestion, but now is actually being put into practice in Russia. One plant for this purpose has been established at Gorlovka, and another is being constructed in the Tula coalfields south of Moscow. The method is to seal the shafts leading to the seams, and to ignite the coal. Compressed oxygen is fed into the seams, and the rate of flow of this is carefully regulated so that the mine becomes a gigantic gasworks retort. The product is then piped to the surface.

A Portable Crack Finder

Readers of the "*M.M.*" no doubt will be familiar with the modern method of finding minute flaws or cracks in steel that are invisible by ordinary means, but yet may open out and lead eventually to failure that might cause a serious accident. In this method the part to be tested is first strongly magnetised, and then is dipped in a prepared fluid, or has the latter poured over it, when any cracks are shown up at once as dark lines. The fluid used in this remarkable test is an oil containing fine iron dust in suspension, and the iron dust is attracted to the cracks because their edges form magnetic poles.

Crack detectors have been installed in engineering works and have proved their value in many ways. A portable crack detector that costs only 10/6 has now been placed on the market by Metropolitan-Vickers Electrical Co. Ltd. It consists of a thin disc-shaped container that is filled with the dust-laden oil and has one side or both transparent. A steel part to be examined with its aid is first magnetised and the detector is then placed upon its surface, preferably in a horizontal position, and gently tapped or rocked. Within 15 to 20 secs. any cracks are clearly indicated by a black line of iron particles. The detector is quickly made ready for use in another test by simply shaking it.

His Eminence Mgr. Hinsley, Cardinal Archbishop of Westminster, inspecting a model railway at the Merry Market, which he opened at Westminster Cathedral Hall. Photograph by courtesy of "The Universe."

Skybird League Rally

The Sixth Annual Model Rally of the Skybird League takes place this month, and we are asked by the organisers to announce that all models must be despatched to the Skybird League Headquarters by 18th March. The prizes in the competitions at the Rally include a handsome Challenge Cup presented by Mr. Henry Channon, M.P., a return flight from Croydon to Paris by Imperial Airways, and a series of free flights by courtesy of British Airways, Olley Air Service and the Air League of the British Empire. There is a special section for ladies, with a Challenge Cup presented by Lady Mairi Stewart as the premier award. Full details of the competitions can be obtained from the Secretary, The Skybird League, 3, Aldermanbury Avenue, London E.C.2.

One From Nine Leaves Eight!

By D. R. Howard

Our cat "Ruffy," a black half-Persian, is very fond of sitting on a paper or cloth, and if given the chance will bury herself in a pile of either that is left lying about. One Friday morning my mother was sorting the linen to go to the laundry and Ruffy was prowling around her. The linen was finally packed up in a large sheet and sent off to the laundry, during transit being dropped some 10 ft. to the ground; this was about 10 o'clock in the morning.

At lunchtime we missed Ruffy, but thought nothing of it as she often stays out for long periods. At teatime we began to get worried about her, however, for she generally comes in about four o'clock. Then at five o'clock we received a telephone call from the laundry to the effect that they had just opened a bundle and found a black cat inside. Was it ours? We told them that it probably was, as our cat, a black one, was missing.

One of the staff very kindly brought the animal along, and sure enough it was Ruffy. She was a bit dazed, but quite unhurt. This was surprising considering that she had been shut up inside blankets and sheets for seven hours, and had survived a 10 ft. drop and the jolting in the laundry van, with bundles on top of her. Incidentally, we were told that if the bundle had not arrived in time to be opened that day, the cat would not have been released until the following Monday, by which time she would probably have been suffocated!

Railway Photographs

We have just received from the Real Photographs Company, Liverpool, their latest list of locomotive post cards. This is very comprehensive, giving photographs of engines now in use on British and many overseas railways, and of historic early locomotives. The list of British engines is particularly extensive, covering the latest products of the four railways and also those of the companies from which they were formed by amalgamation. Samples of these cards sent us by the firm show them to be of very high quality in regard to both photography and reproduction.

With the list of railway photographs we received others dealing with the aeroplane and ship postcards also issued by the firm. These too are extensive in range and of excellent quality, and between them they cover practically every phase of aviation and shipping.

The cards are published at 3d. each, 2/6 per dozen, and larger photographs also are available. Copies of the three lists and sample postcards can be obtained on writing to the Real Photographs Company in accordance with the notice in their advertisement on page xvi of this issue. The "*M.M.*" should be mentioned when writing.

Bond's "Model and Experimental Engineering Handbook"

The latest edition of the catalogue issued by Bond's O'Euston Road Ltd., 357, Euston Road, London N.W.1 (price 6d. post free) lives up to its title of "*Model and Experimental Engineering Handbook*." It gives details not only of finished models of all kinds, but also of the various castings, parts and raw materials needed by the model engineer. In addition hints and tips on model railway work, on steam locomotives, and notes on workshop operations also are given.

The catalogue covers a very wide range. The model railway section, which is particularly interesting, includes illustrations and details of locomotives, rolling stock, track and accessories for Gauge 0, Gauge 00 and Gauge H0. The list of parts available for constructional work in these gauges is very complete, and will be found of value to all who prefer to construct their own locomotives and railways. This section definitely represents a great advance on the firm's previous catalogue.

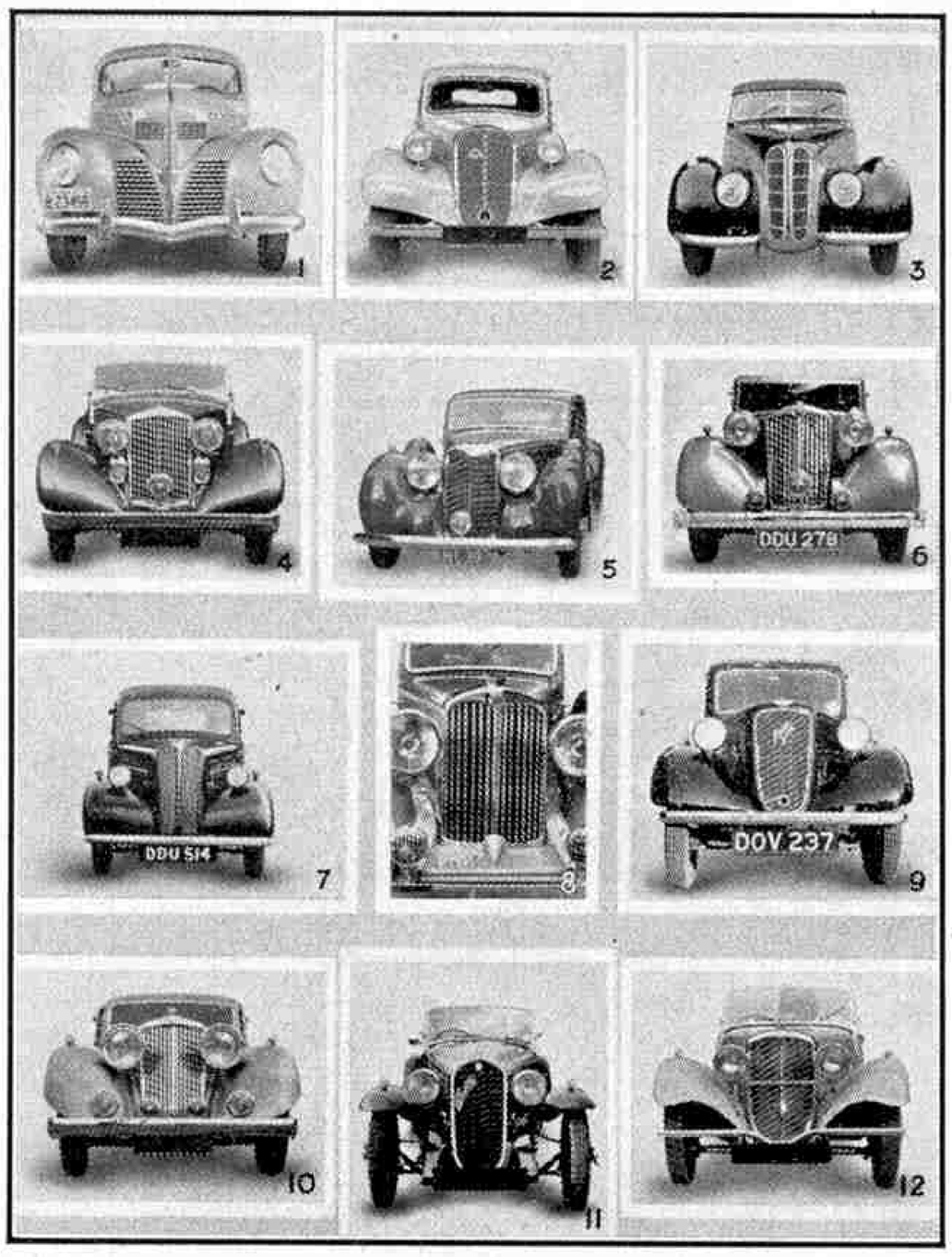
In the model engineering section, all the best features of last year's catalogue are included, along with a variety of new ones, and the enthusiastic amateur will find here practically everything he is likely to want. Particularly interesting are the details of stationary steam engines, obtained either finished or in the form of complete sets of castings, with drawings.

Competition Corner

CAR "FACES" VOTING CONTEST

This month we present another contest in which readers are asked to say which of 12 car fronts they prefer, and to forecast the general choice of all competitors. The front views of motor cars are particularly distinctive, for the design of the radiator grille, the flow of the wings and the positions of the lamps, horns and other accessories give every make its own individual "face" and transform it into something more than a mere piece of mechanism. These are features in which all readers of the "*M.M.*" are interested.

The cars selected for this contest are shown in our illustration and are all well known makes. In numbered order they are Dodge, Citroen, Frazer Nash, Sunbeam-Talbot, Lagonda, Lea Francis, Flying Standard, A.C., Austin, S.S. Jaguar, Fiat and B.S.A. respectively. Readers are asked to state on a postcard A, which of these car fronts they consider to be the most attractive, and B, to forecast the order of popularity of the twelve cars as decided by the massed opinions of all our readers.



In competitors' lists the car "faces" should be referred to by the numbers marked on them, and it must be emphasised that only the front features, that is those shown in the illustrations, must be taken into account in preparing entries. Competitors need not place their own choice at the head of list B if they do not think it likely to prove a general choice. They must place it where they think it will stand in the popular opinion.

Prizes of Meccano products value 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the entries that most accurately forecast the final order of popularity. In addition there will be a number of consolation prizes. Should there be a tie for any of the prizes, preference will be given to the entry displaying the neatest and most novel presentation. No competitor may submit more than one effort.

Entries must be addressed to "*Car Faces Voting Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 31st March. Overseas readers are invited to take part in the special Overseas Section of this contest. The prizes in this section will be the same in value and number as in the Home Section. Entries to the special Overseas Section must arrive not later than 30th June.

March Drawing Contest

This month's contest will be the last of the current series of winter drawing contests, and we hope that every reader who is able to draw or paint and has not yet submitted entries to our competitions, will do so this month.

The competition is open to readers of all ages. No special subjects are set, the prizes being offered simply for the best drawings or paintings submitted during the month. Entries may be of any size.

The entries will be divided into the usual two sections, A for readers aged 16 and over, and B for those under 16; and prizes of Meccano products or artist's materials, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section. There will be separate sections with similar prizes for Overseas readers.

Entries to this month's contest should be addressed "*March Drawing Contest*," Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st March. Overseas closing date, 30th June.

Competition Closing Dates

HOME		
Car "Faces" Voting Contest	...	**31st March**
March Drawing Contest	... ...	**31st March**
Countryside Photo Contest	...	**31st March**
OVERSEAS		
Stamp Voting Contest	... ...	**31st March**
"Advertisement Jig-Saw" Contest		**31st March**
December Drawing Contest	...	**31st March**
December Photo Contest	... ...	**31st March**
Cover Voting Contest	... ...	**29th April**
January Drawing Contest	... ...	**29th April**
January Photo Contest	... ...	**29th April**
"Artificial Light" Photo Contest	...	**29th April**
Stomachion Puzzle ...	... ...	**31st May**
February Drawing Contest	... ...	**31st May**
Countryside Photo Contest	...	**31st May**
Car "Faces" Voting Contest	...	**30th June**
March Drawing Contest	... ...	**30th June**

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group.

COMPETITION RESULTS

HOME

January Cover Voting Contest.—1. A. Miller (Woking). 2. K. E. Milburn (London E.4). 3. D. T. Stott (Rochdale). 4. B. Jupp (Kingston). Consolation Prizes: E. A. J. Balch (Swindon); F. Horner (London E.18); A. Skelhorn (Widnes); D. V. Thornton (London N.W.4); J. Woods (New Milton).

January Drawing Contest.—First Prizes: Section A, L. M. R. Tucker (Reigate); Section B, J. Saunders (Farmoor). Second Prizes: Section A, J. V. Browne (Luton); Section B, S. Bowles (Grimsby). Consolation Prizes: G. H. Cole (Wigton); S. Jennings (London N.1); G. Lodge (Newcastle-on-Tyne 2); N. Patton (Sandown, I.W.); R. Sutherland (Glasgow W.2); F. M. Whittaker (Blackburn); Miss M. Wright (Peterborough).

January Photo Contest.—First Prizes: Section A, J. R. Tottle (Taunton); Section B, M. J. A. Broom (London S.W.11). Second Prizes: Section A, R. F. Crane (March); Section B, D. McMurtrie (Paisley). Consolation Prizes: J. Brighton (Diss); L. J. Slater (Portsmouth).

OVERSEAS

September Photo Contest.—First Prizes: Section A, P. Halbwachs (Curepipe, Mauritius); Section B, K. Harris (Kowloon, Hong Kong). Second Prizes: Section A, D. G. Tees (Durban, S. Africa); Section B, C. R. Anderson (Timaru, N.Z.).

September Crossword Puzzle.—1. S. H. Draper (Ottawa). 2. E. P. Tapper (South Perth, W. Australia). 3. L. Hurter (Caledon, S. Africa). 4. D. J. White (Christchurch N.1).

SING AS YOU GO

The vocalist at the local concert seemed to have an endless repertoire. The fact that his voice was beginning to grate on the audience did not in the least deter him.

At last one of the exasperated listeners bawled out: "Hi! D'yer know 'The Long Trail'?"

"Why, yes," said the vocalist, "shall I sing it?"

"No," came the reply. "Hike it."

* * * *

"Vell, Vilhelm, vot do you know? Vot did dey teach you up in school?"

"Oh, Latin and Greek," answered the youth, "and German and algebra."

"So, so," mused the old German. "And vot's der algebra for cabbage now?"

* * * *

Lady: "Why are these canaries you sold me so green?"

Hawker: "Lack o' sun, mum, when they was 'atchin out. They'll soon ripen if you put their cage in a sunny winder."

* * * *

Auntie: "Why don't you get on with your dinner, Charlie?"

Charlie: "I'm waiting for the mustard to cool."

* * * *

Two street sweepers were discussing the merits of a new man who had been hired to help them in their work.

"An' what do you think uv new man, Pat?" asked one.

"Divvil a bit," replied Pat. "He might be all right on th' up and down sweeping, but let him try a bit of fancy work around a lamp-post, then we'll be seeing his abilities."

* * * *

"Son," asked the father, "what is an average?"

"Why," said the boy, "it's what the hen in arithmetic lays eggs on."

* * * *

The auctioneer held up a pair of valuable antique silver candlesticks.

"Will someone give me a start?" he began.

"Fourpence," came a reply.

"What's that?" queried the auctioneer.

"Ah," retorted the bidder, "I thought that would give you a start."

* * * *

A teacher wrote to a parent about his awkward boy: "I have taught your son all I know—and he knows nothing."

* * * *

Guard (to Scotsman in train): "This is a platform ticket you have."

Sandy: "Aye, but I want to go to another platform."

* * * *

Teacher: "What is a tannery?"

Pupil: "The place where they make sixpenny bits."

* * * *

First Scout: "Join me in a glass of lemonade."

Second Scout: "You get in first and I will see if there is any room left."

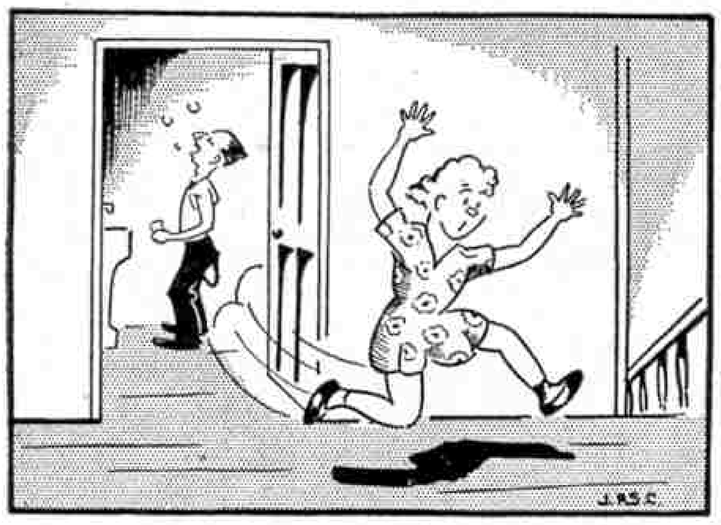
* * * *

Mother: "If you fell in the water, why are your clothes dry?"

Tommy: "I took 'em off in case of accident."

* * * *

ONLY BUBBLING



Eve (seeing father gargling his throat): "Mummy—come quick! Daddy's boilin' over."

HARD LABOUR

Old Lady (to circus hand): "Why are you so sad my man?"

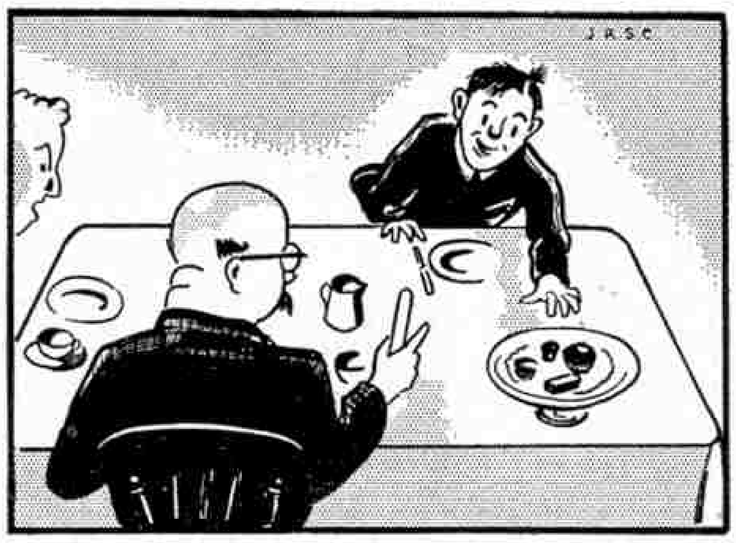
Circus Hand: "Big Bertha the elephant is dead."

Old Lady: "Were you so fond of it?"

Circus Hand: "No mum. I've got to bury it!"

* * * *

TOO SHORT



Bobby was reaching for a particularly attractive chocolate cake, on the other side of the table.

"Haven't you got a tongue, young man?" said his father.

"Yes, dad," was the reply, "but it won't reach so far!"

* * * *

Two country youths were on a visit to the city. They went into the local Museum and saw a mummy, over which hung a card on which was printed, "B.C.2600."

They were mystified, and one said: "What do you make of that, Sam?"

"Well," said Sam, "I should say it was the number of the motor car that killed him."

* * * *

New Maid (to footman): "What is the meaning of the big 'D' on the lid of that dustbin?"

Footman (haughtily): "The 'D' dramatically displayed on that dingy depository for dirt and dust denotes that the despairing domestics of the detached domicile of a dignified dame desire that the deserving dustmen will deem it their duty deliberately and deftly to dislodge the degrading dirt and disastrous dust deposited inside its deceptive and dark depths."

* * * *

Magistrate: "You're a danger to pedestrians. You'll not be allowed to drive for two years."

Defendant: "But, sir, my living depends on it."

Magistrate: "So does theirs."

* * * *

There was a young man called Paul,
Who grew so tremendously tall,
That, when in bed,
He could stretch out his leg,
And turn out the light in the hall.

* * * *

Headmaster (at the 'phone): "Oh, yes, Bobby James is very ill and is unable to come to school, is he? Who is that speaking?"

Deep voice: "My father."

* * * *

Two commercial travellers were swapping tall wireless stories in the presence of an old countryman whom they were trying to impress.

"You got a radio set?" asked one of the travellers.

"Yes, sorr," said the countryman. "I got a very good one."

"Has it good selectivity?" asked the traveller, with a knowing wink at his companion.

"Well, yes," said the old fellow, "it has. The other night I was listening to a quartet, and I didn't like the tenor, so I just tuned him out and listened to the other three."

* * * *

THIS MONTH'S HOWLER

Mediocre is a kind of milk pudding.

TOP SCORE!

Three football enthusiasts were seated on the roof of the grandstand at the Cup-tie.

1st Fan: "Hooray. One for Everton."

2nd Fan: "Whoopee. One for Liverpool."

3rd Fan (as the two pals fall off the roof with excitement): "Bravo. Two for the Royal Infirmary."

* * * *

The new Irish butler was announcing the guests.

"Mr. Jones, Mrs. Jones, Miss Jones," he said.

"Shorten your announcements, Patrick," whispered his employer. "Mr. Jones and family would have been sufficient."

The next arrivals were Mr. Penny and his family.

"Mr. Penny," announced Patrick, "and all the small change."

* * * *

"I wouldn't cry like that," said auntie to her little niece.

"You can cry any way you like, auntie," said the little girl, "but that's my way."

* * * *

"Now, Tommy," said the geography teacher, "how do you know the world is round and hangs on nothing in the air? How do you prove it?"

"I don't have to prove it," replied Tommy. "I never said it was."

* * * *

Willie: "My history teacher is the meanest man I know."

Father: "How it that?"

Willie: "He borrows my penknife to sharpen his pencil to give me bad marks."

* * * *

Actor: "And where, madam, do I perform my ablutions?"

Landlady: "You don't go doing no performances here. The 'ouse was nearly wrecked last week by a troupe o' hacrobats."

* * * *

Teacher (in grammar class): "Am I right if I say 'you was late'?"

Tommy: "No, sir."

Teacher: "Why?"

Tommy: "Because I was not late, sir."

* * * *

Customer: "Waiter, this steak is like leather and the knife is blunt."

Waiter: "Well, why don't you strop the knife on the steak."

* * * *

Father: "Well, Freddy, how did you like your first day at school?"

Freddy: "The boys round me were fine, lively fellows, but I don't think much of the old chap in the cash-desk."

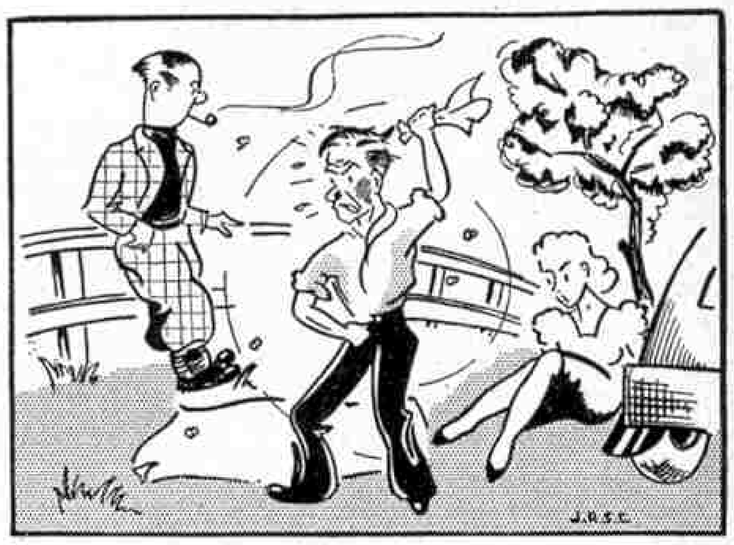
* * * *

Poultry Farmer: "Yes, there is money in eggs."

Old Lady: "That's funny, I haven't found any yet."

* * * *

THEY KNEW!



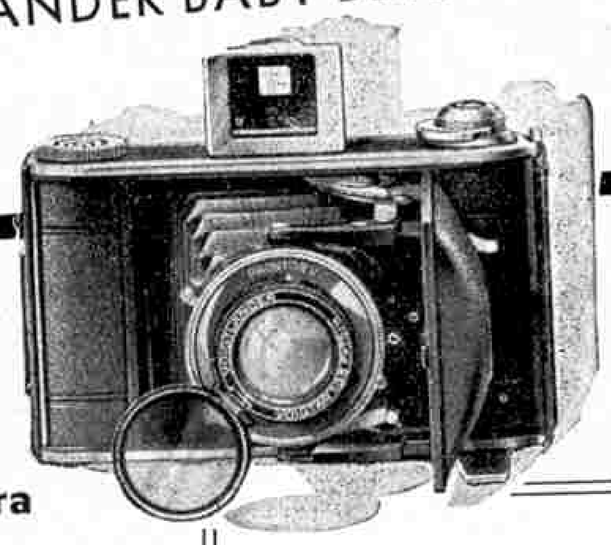
A picnic party had just sat down to their meal.

"Isn't this an ideal spot for a picnic?" said Tom, as he gazed at the surrounding scenery.

"It must be," replied Jack. "Ten thousand wasps can't possibly be wrong."

THE VOIGTLANDER BABY BESSA F/3.5

£6:10



Never before has there been such value in a miniature camera

No other miniature camera can offer the Baby Bessa's features at the Baby Bessa's price. Made by a firm as old as photography itself, it incorporates all the newest principles that make for easy operation and better results. Study its features listed alongside—see this new Voigtlander model at your photographic dealers—examine its construction—see how beautifully it is finished—and you will agree that it's not only new in design, but that it sets an entirely new standard of value!

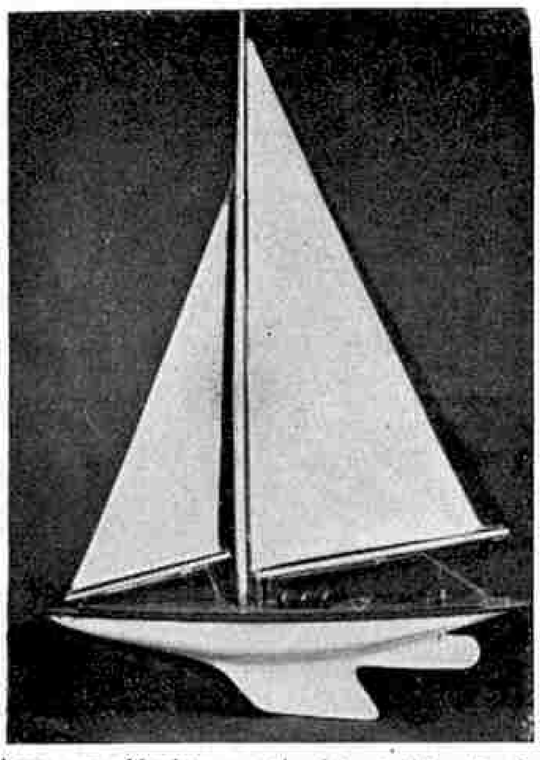
★ *Trigger release under baseboard.*
★ *Hinged yellow filter in interchangeable mount.*
★ *Folding frame-finder.*
★ *Takes 12 pictures 2¼" square on standard 120 or 620 size film.*
★ *Small, pocket-size and lightweight.*
★ *F/3.5 Voigtar lens in Prontor D.A. Shutter (1 to 1/175th sec.)*
★ *Safety lock to back.*
★ *Lens mount focussing with simple snapshot setting.*
★ *Real leather bellows.*
★ *Dull chromium finish.*

For further details ask your dealer or write to Schering Ltd. (Voigtlander Dept. 4), 185-192, High Holborn, London W.C.1

Voigtländer

OPTICAL CRAFTSMEN SINCE 1756

"Endeavour" Yachts



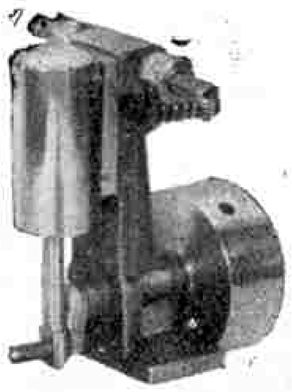
These new Yachts are the latest thing for fast racing work. All of the hulls are hand made in best yellow pine. The two largest Yachts are fitted with Braine type automatic steering. Painted Pale Blue. Cabin Skylight extra.

Prices:

17 in. Yacht with automatic rudder ...	12/–
21 in. Yacht with automatic rudder ...	18/6
27 in. Yacht with Braine type steering	39/6
36 in. Yacht with Braine type steering	75/–

Carriage extra.

Oscillating Steam Engines for Boats



These engines have been completely re-designed throughout to get higher speed and more power. The main engine standard is now made from a hot brass stamping and is complete with pipe unions. The cylinder and pistons are machined from solid brass. All engines are fitted with large flywheels.

W252. OSCILLATING MARINE ENGINE. Single oscillating type. ⅜-in. Bore, ⅝-in. Stroke. Suits Boats 18 in. long **3/9**

W253. OSCILLATING MARINE ENGINE. Oscillating Single Acting Cylinder. ½-in. Bore, ⅝-in. Stroke. Suits Boats 24 in. long. Price **5/–**

Suitable Boilers for above, complete with lamp and safety valve. Price **8/–**

Send for Bond's 208 page 1939 Catalogue, **Price 6d.** post free. It illustrates and lists all the requirements of the Model Maker and includes all Tools and Materials.

BOND'S O' EUSTON ROAD LTD.

357, Euston Road, London N.W.1

Telephone: EUSton 5441–2. Est. 1887.

Spot the

RALEIGH

Boys—**Their cycles are miles ahead because of easy-running**

MODELS

From **£4 : 16 : 6** *cash (Sturmey Archer 3-speed gear 21/- extra, cash.) Deferred Terms from* **5/-** *down and 12 equal monthly payments (from 9/3). Sturmey-Archer 3-speed gear 2/1 extra monthly. Dunlop tyres and the best of everything.*

Tom, Dick and Sam *know* the Raleigh must be the world's finest cycle. They know that the Raleigh runs easily and sweetly—that it will stand up to hard knocks and schoolboy treatment. Dad knows it too. You'll find it much easier to get a cycle if you tell him you want a Raleigh.

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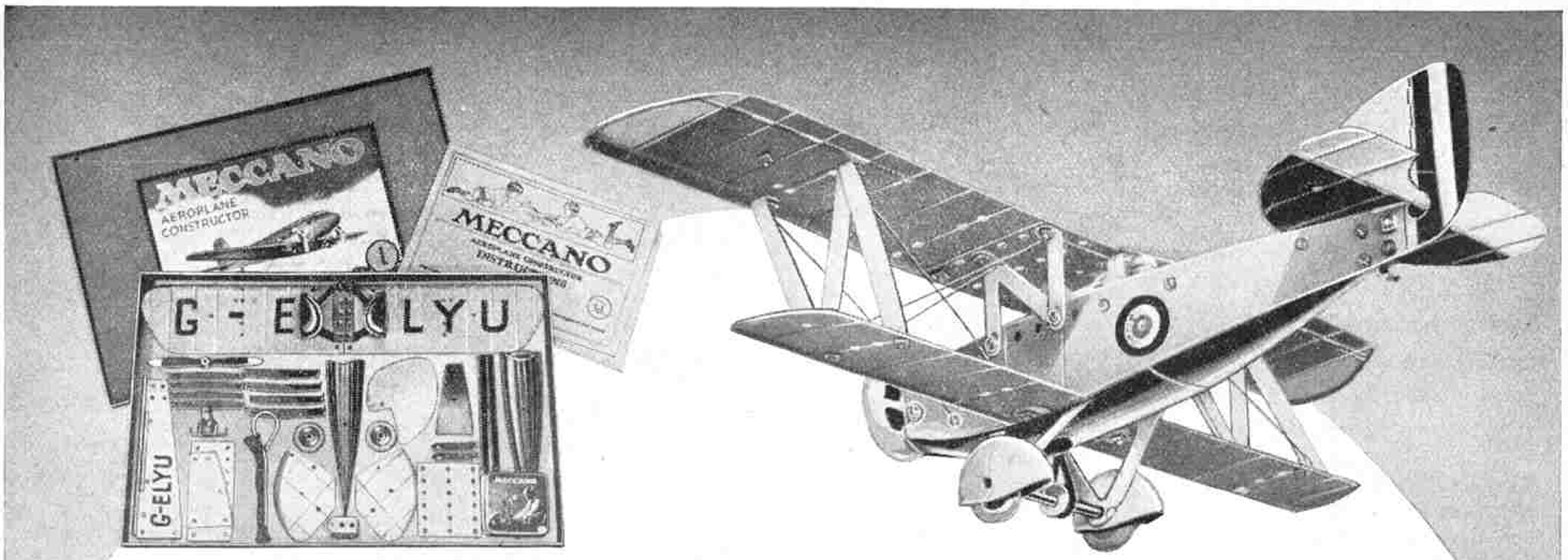
RALEIGH

THE ALL-STEEL BICYCLE

Fit the Sturmey-Archer 3-speed gear—the gear that "makes cycling easy



MECCANO AEROPLANE CONSTRUCTOR OUTFITS

Every boy should know how aeroplanes are designed and constructed and should be able to recognise the different types of machines at a glance. These fine Constructor Outfits contain a range of aeroplane parts by means of which boys are able to design and build their own Aeroplanes quite easily.

Price List of Aeroplane Outfits

	Standard Series				
No. OO Outfit	**3/3**	No. 1 Outfit	**7/11**		
No. O Outfit	**4/6**	No. 2 Outfit	**13/6**		
	Special Series				
No. 1 Special Outfit ...	**13/6**	No. 2 Special Outfit ...	**22/6**		

Note. The parts in the No. OO and No. O Outfits are not intended for use with the larger Outfits.

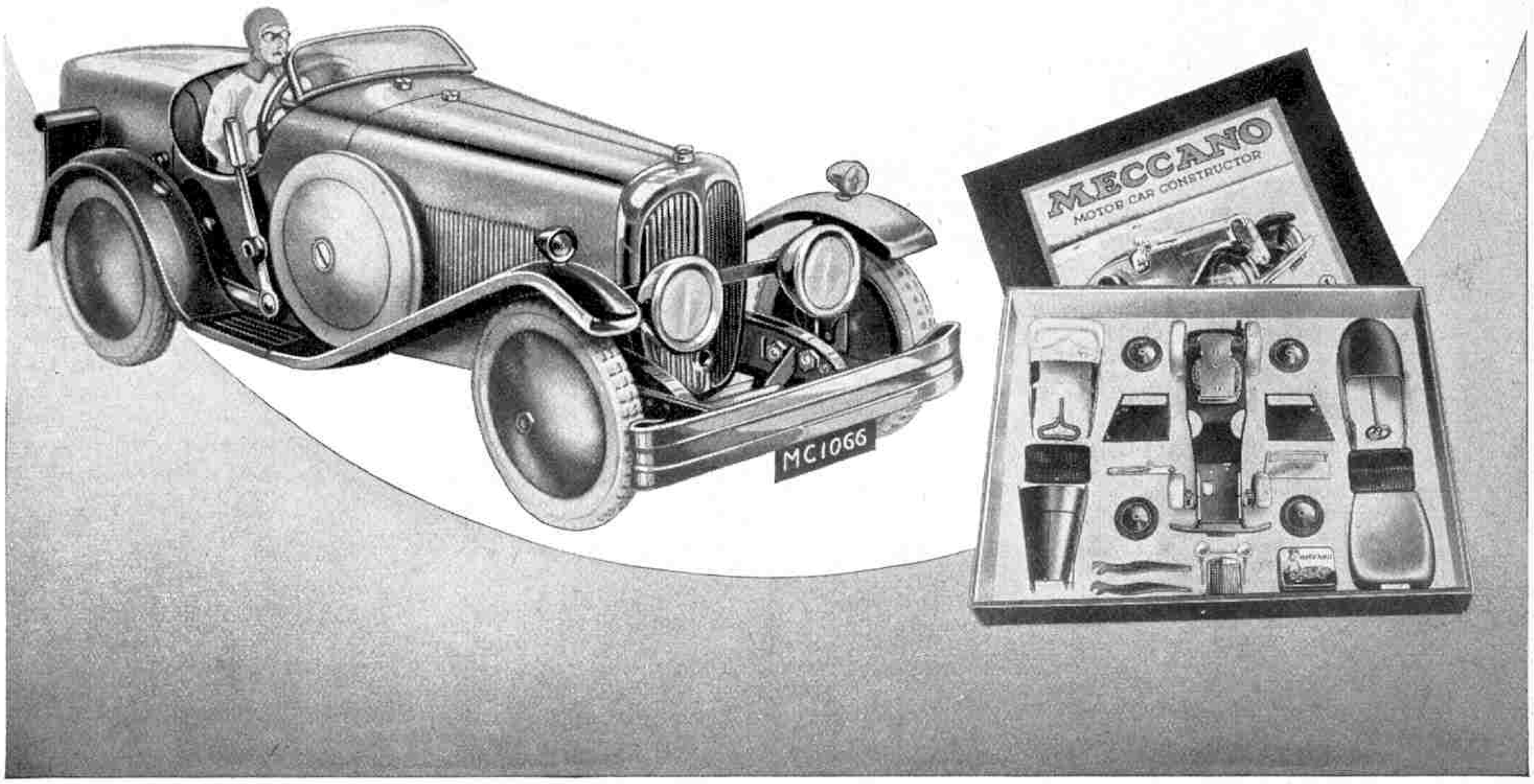
MOTOR CAR CONSTRUCTOR OUTFITS

Now is the time to get a Meccano Motor Car Outfit. You will never grow tired of building and running the superb models that you will be able to build. Your days will be full of fun and thrills!

Perfect miniature reproductions of many different types of car can be built with these splendid Outfits, and a powerful clockwork motor, that gives the models a long run on one winding, is included in each Outfit.

Prices of Motor Car Outfits

No. 1 Outfit ... ... **9/6** | No. 2 Outfit **18/9**



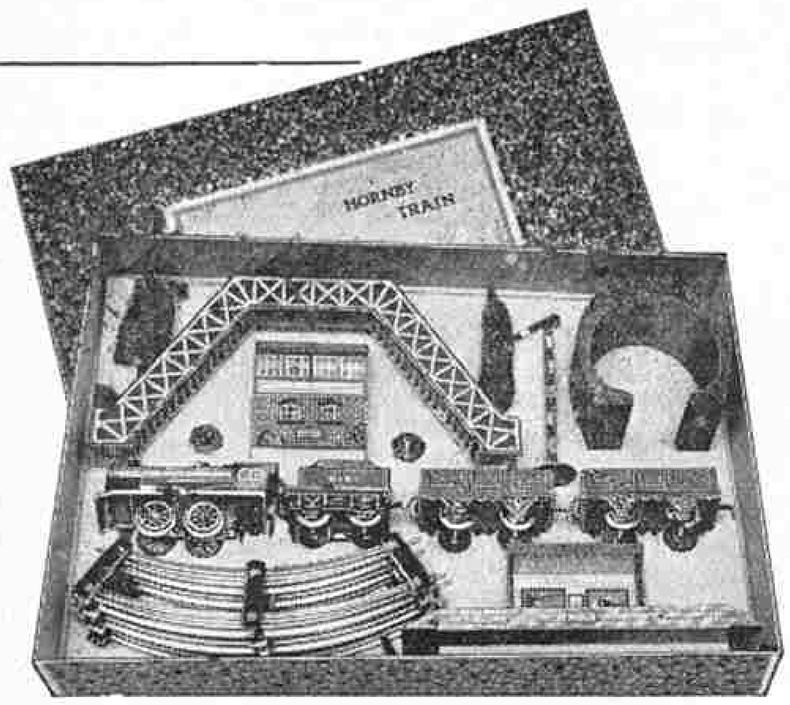
MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

COMPLETE MODEL RAILWAY SETS

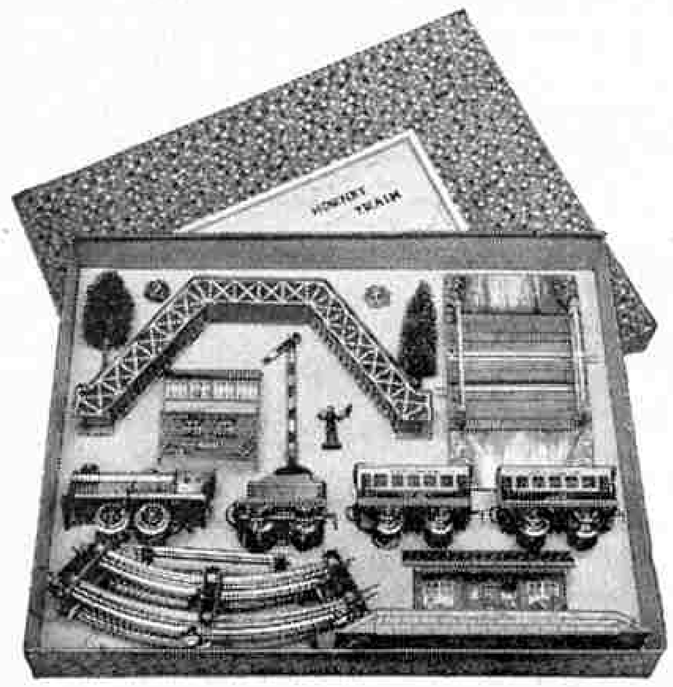
Right away for Happy Days!

These fine Model Railway Sets provide the simplest way of beginning the fascinating Hornby Railway hobby. Each Set is complete in itself; everything is there, ready for use as soon as you get it home.

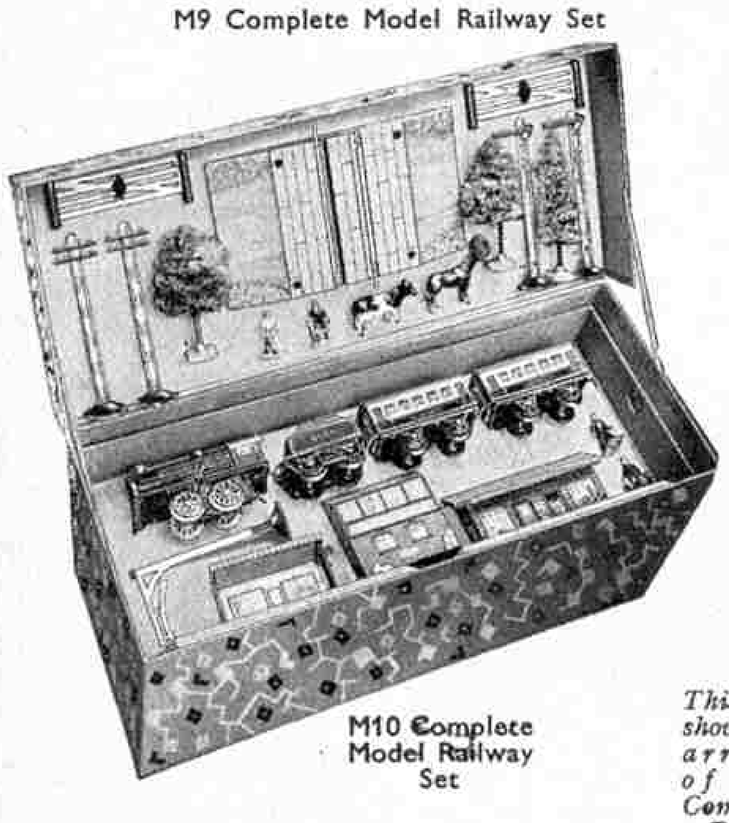
Unpack the box, then lay out the rails and accessories as shown in the illustration provided, put the locomotive and coaches or wagons on the track, and begin to run your own railway! it's the greatest fun in the world!



M8 Complete Model Railway Set



M9 Complete Model Railway Set



M10 Complete Model Railway Set

M8 Complete Model Railway

Consists of a fine non-reversing Locomotive that can be braked from the track, Tender, two Goods Wagons and Set of Rails; Wayside Station, Footbridge, a Signal and Signal Cabin, two Trees with Stands, and Tunnel. Packed in a strong carton as illustrated. Price 9/11

M9 Complete Model Railway

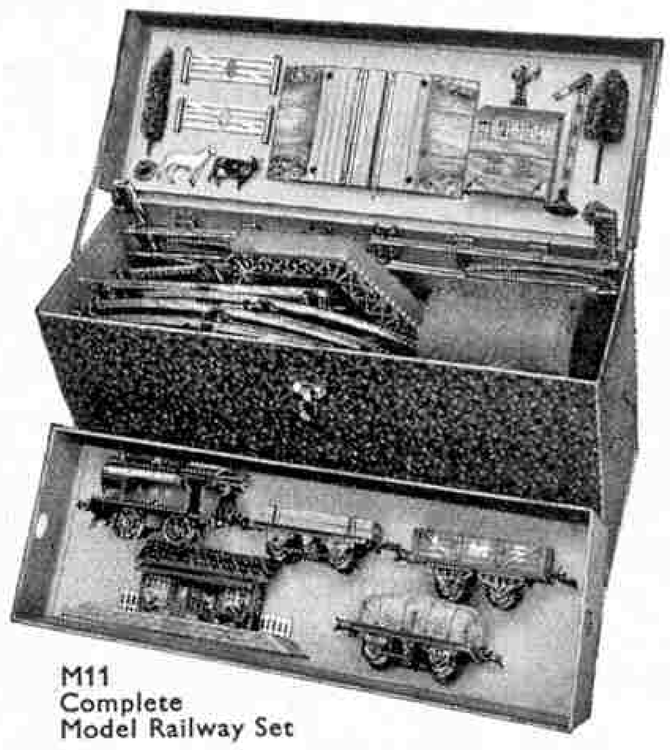
This Set includes a non-reversing Locomotive that can be braked from the track, Tender, two Passenger Coaches and Set of Rails; Station, Footbridge, Signal and Signal Cabin, Level Crossing, Guard, Porter, two Trees with Stands and two Hikers. Packed in a strong carton as illustrated. Price 12/6

M10 Complete Model Railway

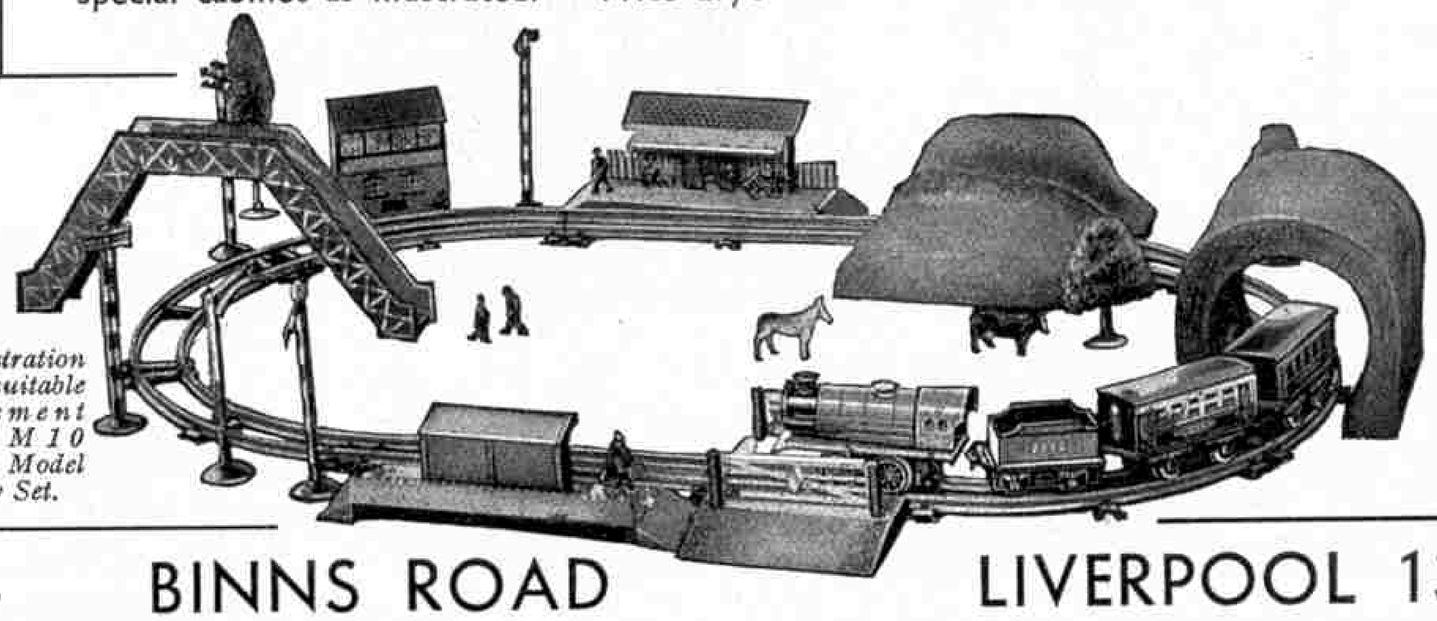
A larger Set containing a non-reversing Locomotive that can be braked from the track, Tender, two Pullman Coaches and Set of Rails; Footbridge, two Stations, Signal Cabin and two Signals, two Telegraph Poles, Loading Gauge, Tunnel, Cutting, Level Crossing, three Trees with Stands, two Porters, two Hikers, Horse and Cow. The Set is packed in an attractive special cabinet as illustrated. Price 19/9

M11 Complete Model Railway

This is the largest and best of the Complete Model Railway Sets. It includes a powerful reversing Tank Locomotive that can be braked from the tank, Fibre Wagon, Timber Wagon, Open Wagon and Set of Rails and Points; Tunnel, Station, Signal and Signal Cabin, Level Crossing, Footbridge, two Trees with Stands, Guard, one Cow and one Horse. The Set is packed in a strong special cabinet as illustrated. Price 27/6



M11 Complete Model Railway Set



This illustration shows a suitable arrangement of the M10 Complete Model Railway Set.

MECCANO LIMITED — BINNS ROAD LIVERPOOL 13

★ . . . that rats cannot board a ship when this gadget is in use? They can swarm up the rope as far as the hollow cone, but owing to its size and shape, cannot get past—in other words they are beaten!

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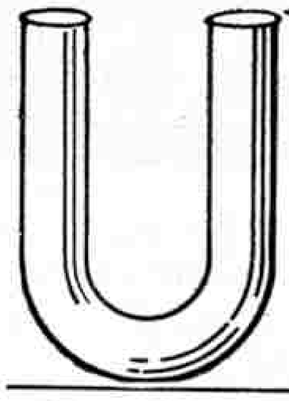
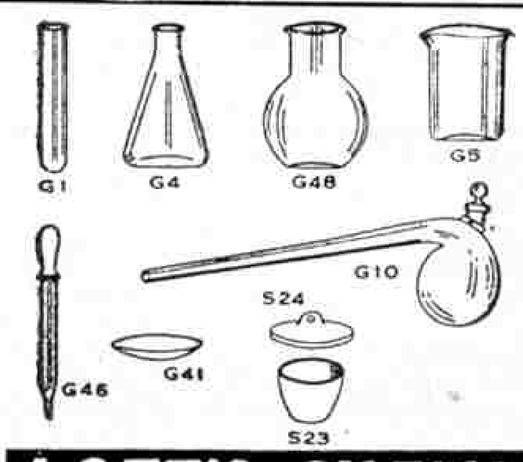


U need these useful spares!



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Lott's New Style Bricks enable you to build in the Modern style—jolly new windows and doors make possible fascinating new models. Lott's Wonderbrix are just right for your No. OO Gauge Railway—you can build garages, cottages, engine sheds, etc.

PRICES: 3'6, 5'-, 8'6, 12'6, 21'-, 27'6 to 105'-

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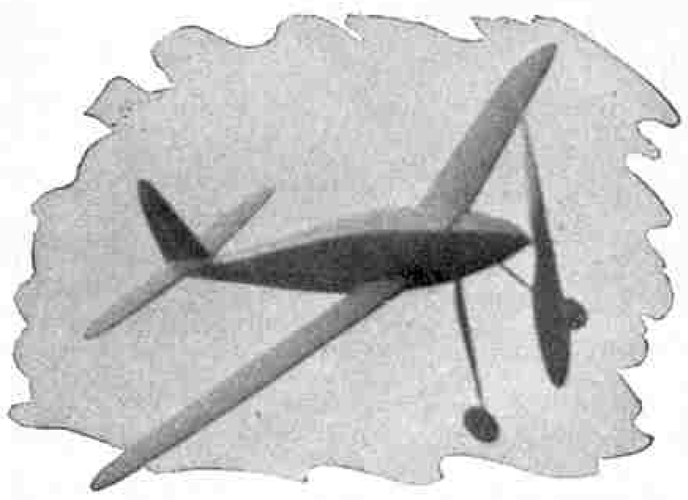

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MECCANO

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If you want to obtain the fullest enjoyment from the Meccano hobby you must operate your models by means of one of the Motors illustrated here.

1 **The MECCANO MAGIC MOTOR** is well designed and strongly constructed and is fitted with a powerful spring giving a long and steady run. It is non-reversing and is intended for driving models built from Outfits No. O to No. 5 ... ... Price **2/–**

2 **No. 1 CLOCKWORK MOTOR.** This strongly built and efficient Motor is fitted with a powerful spring that gives a long and steady run, and is exceptionally smooth in action. The Motor is of the non-reversing type ... Price **4/6**

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4 **No. EO6 ELECTRIC MOTOR (6-volt).** A strongly-built non-reversing Motor of the all-enclosed type. It will drive all the models built from Outfits up to No. 5, and also some of the lighter models built from Outfits No. 6 to No. 8. Price **5/6**

No. EO20 ELECTRIC MOTOR (20-volt). The EO20 is a powerful non-reversing Motor of similar construction to the EO6 Motor illustrated. Price **5/6**

5 **No. E1 ELECTRIC MOTOR (6-volt).** This highly efficient Motor (non-reversing) will give excellent service ... ... Price **7/6**

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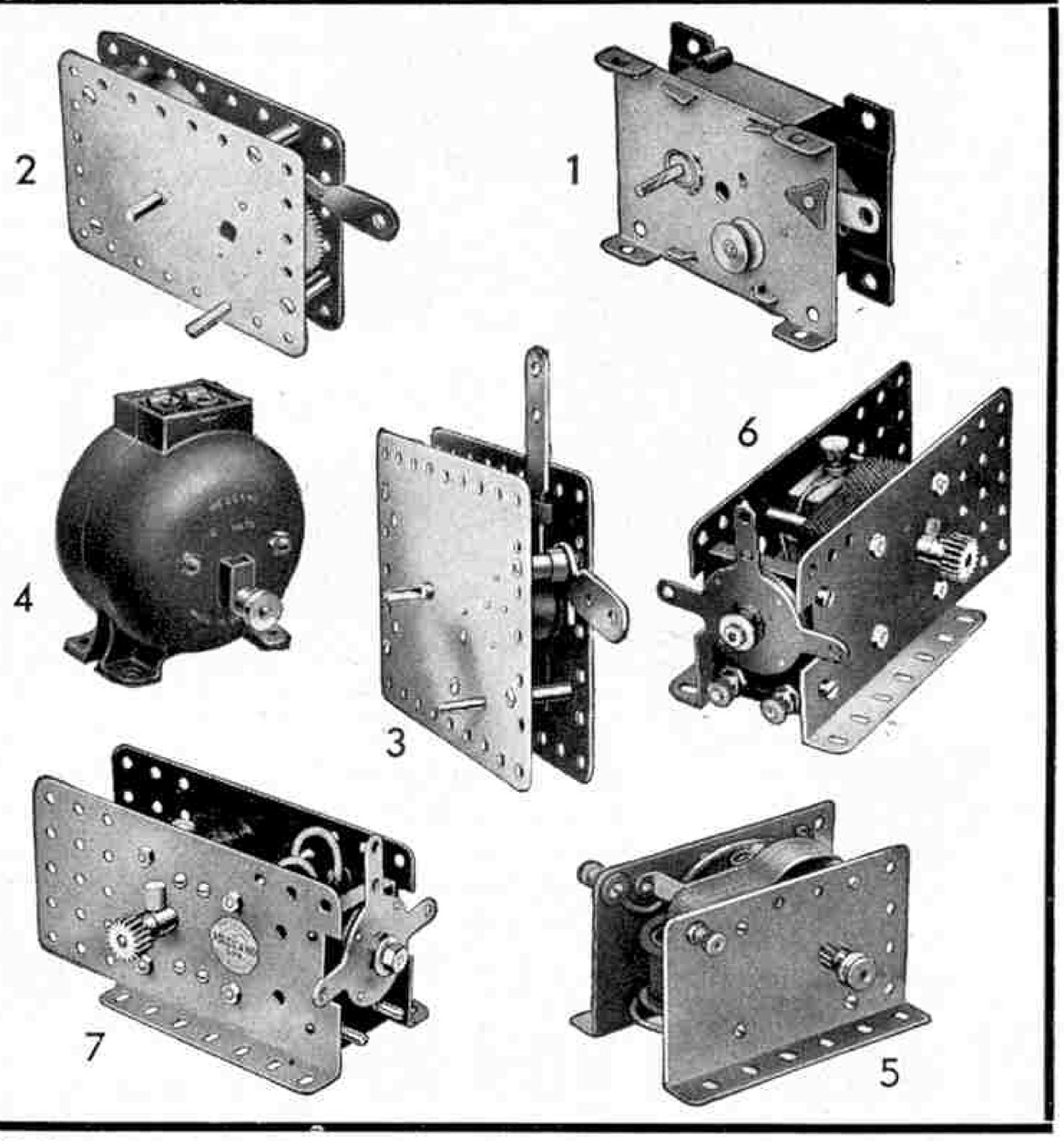

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

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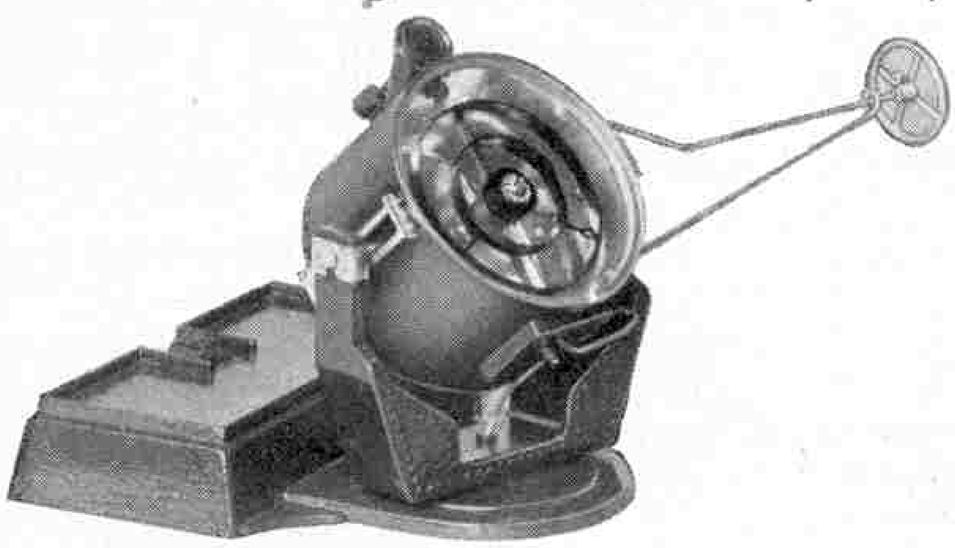

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Price **21/-**

The above illustration gives some idea of this splendid new searchlight. The diameter of the projector is 4 inches and the beam given is really amazing.

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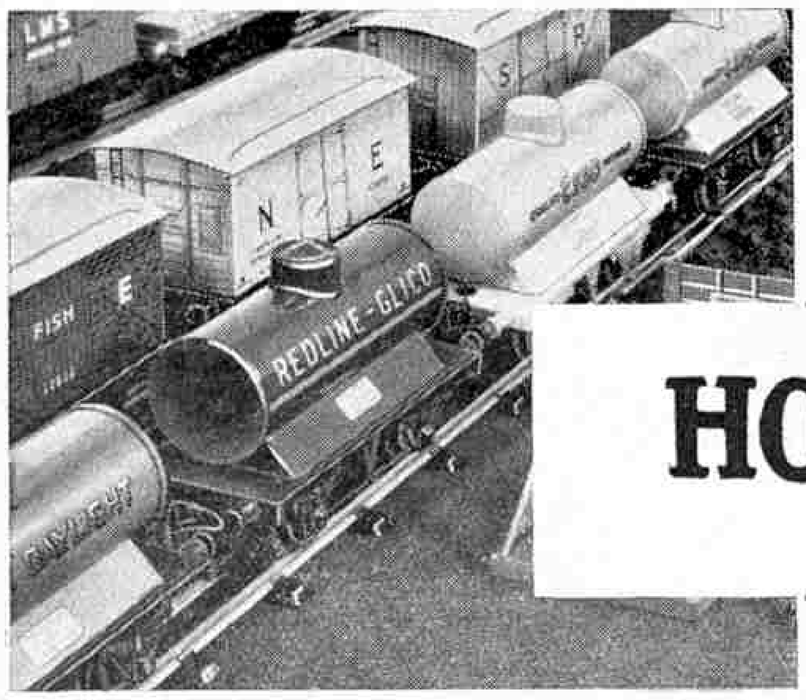

The Hornby Series includes a wide selection of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many other types, all beautifully finished.

An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.

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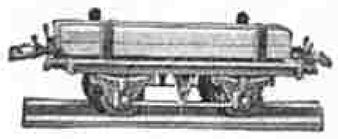
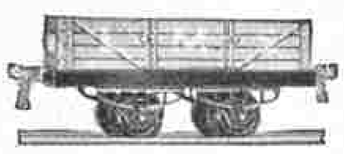
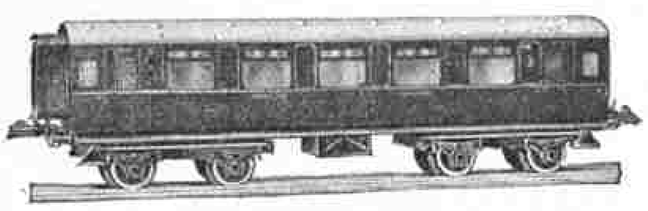


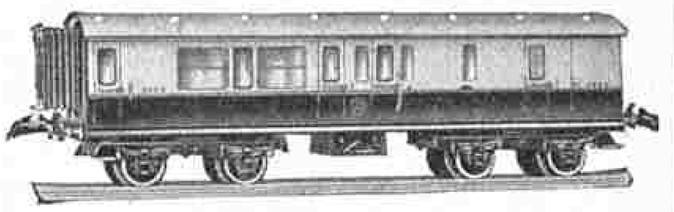
No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red.
Price **1/3**



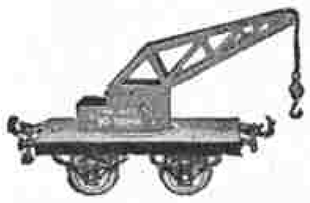
***M1 WAGON**
Price **10d.**



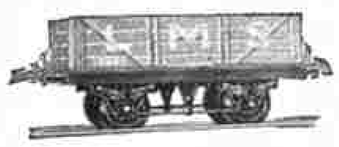
No. 2 CORRIDOR COACH
S.R. Third class. Not suitable for 1 ft. radius rails. Price **7/6**



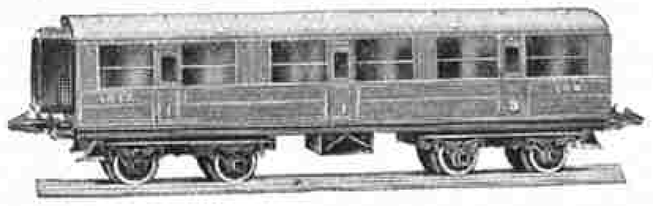
No. 2 CORRIDOR COACH
G.W. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



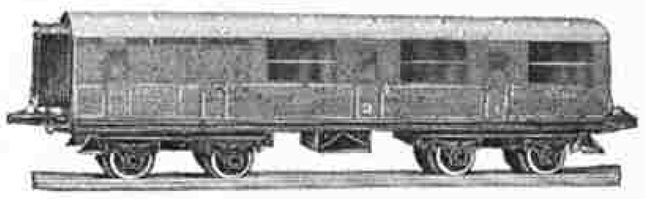
No. 1 CRANE TRUCK
Finished in brown and blue.
Price **2/9**



***No. 0 WAGON**
Price **1/3**

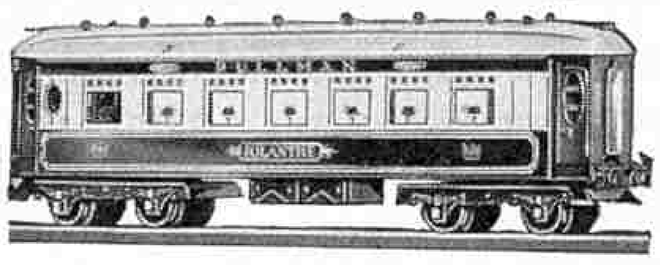


No. 2 CORRIDOR COACH
L.N.E.R. First-third. Not suitable for 1ft. radius rails. Price **7/6**

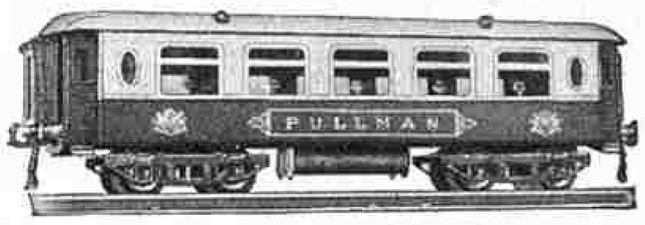


No. 2 CORRIDOR COACH
L.N.E.R. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**

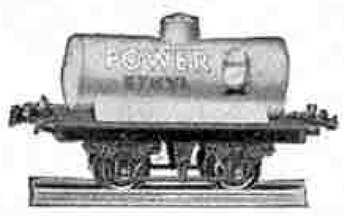
TROLLEY WAGON WITH CABLE DRUMS
Fitted with two Cable Drums. Not suitable for 1 ft. radius rails. Price **4/6**



No. 2 SPECIAL PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **13/6**



No. 2 PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **10/6**



No. 1 PETROL TANK WAGON "POWER ETHYL"
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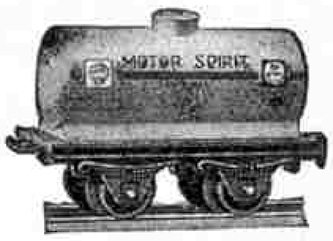
TANK CAR (American Type)
As used in America for the conveyance of oil, etc. Price **1/11**



MO PETROL TANK WAGON "SHELL-B.P."
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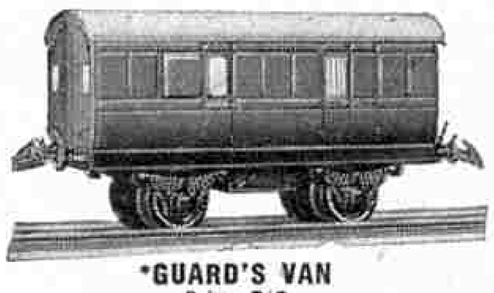
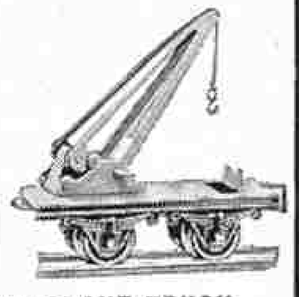
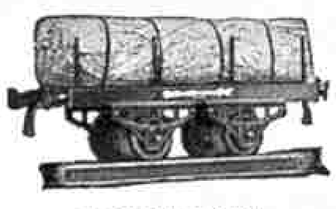


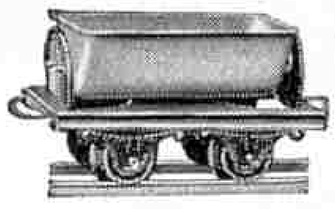
***GUARD'S VAN**
Price **2/6**



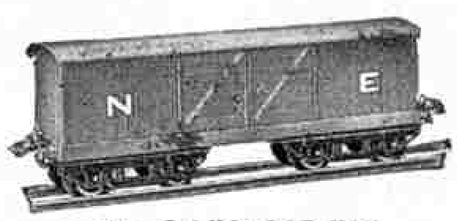
MO CRANE TRUCK
(MO Coupling.) Price **1/-**



FIBRE WAGON
As used in France and other Continental countries.
Price **1/3**

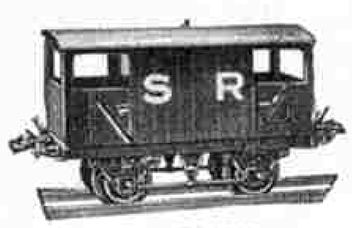


MO SIDE TIPPING WAGON
(MO Coupling.) Price **1/-**

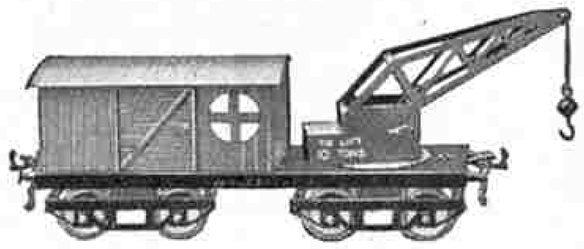


***No. 2 LUGGAGE VAN**
Opening double doors. Not suitable for 1 ft. radius rails. Price **4/6**

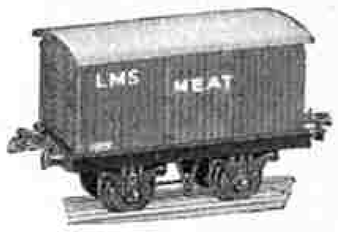
No. 1 SIDE TIPPING WAGON
"Sir Robert McAlpine and Sons." Price **2/-**



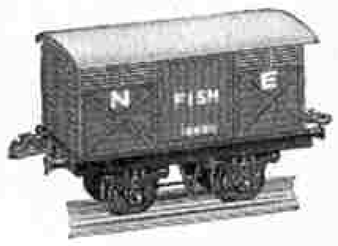
BRAKE VAN
Opening doors. In N.E. or S.R. lettering. Price **2/9**



***BREAKDOWN VAN AND CRANE**
Sliding doors. Not suitable for 1 ft. radius rails. Price **5/11**

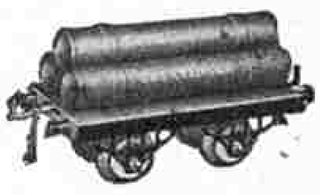


No. 0 MEAT VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**



No. 0 FISH VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**

***FLAT TRUCK**
with Cable Drum.
Price **1/9**



GAS CYLINDER WAGON
Price **1/8**

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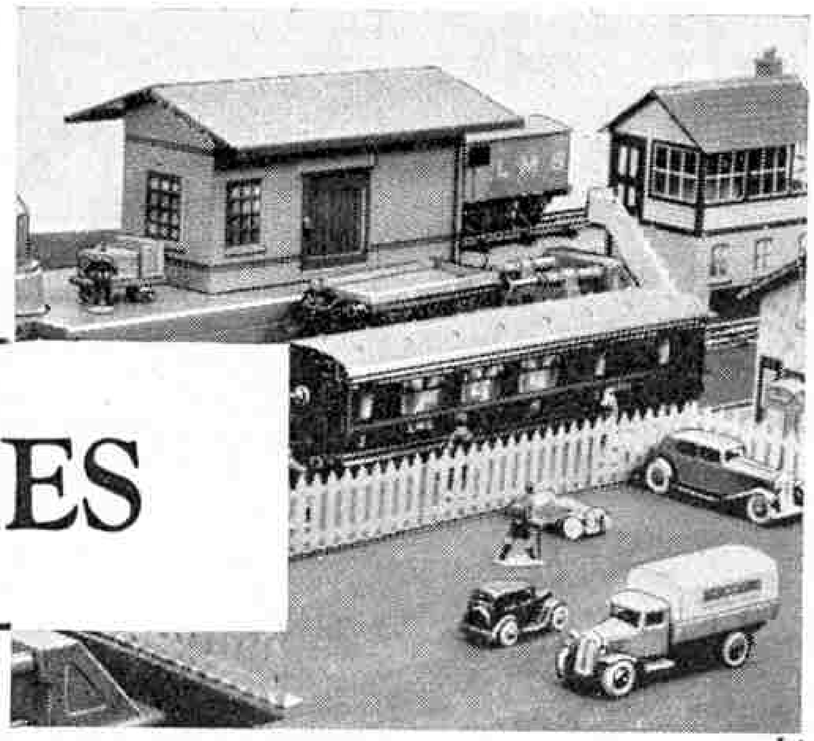
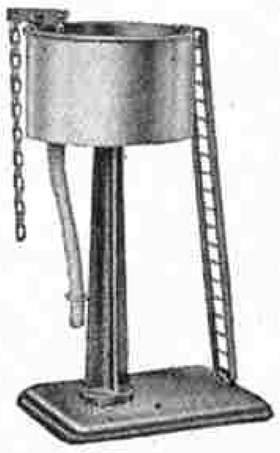
There is a splendid range of Railway Accessories in the Hornby Series, each one built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway can be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.



HORNBY ACCESSORIES

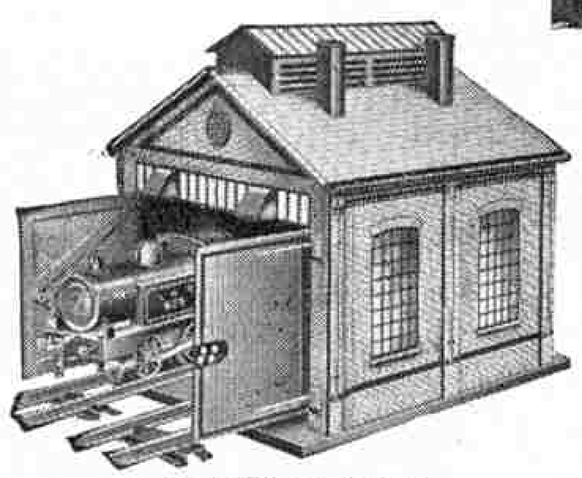
GAUGE O



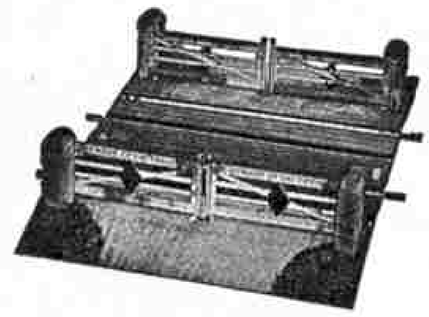
No. 1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever.
Price **2/6**

No. 2 SIGNAL GANTRY
"Home" or "Distant."
Price **11/6**

No. 2E SIGNAL GANTRY
"Home" or "Distant."
Similar to No. 2 Gantry but wired for electric lighting. Price **14/6**



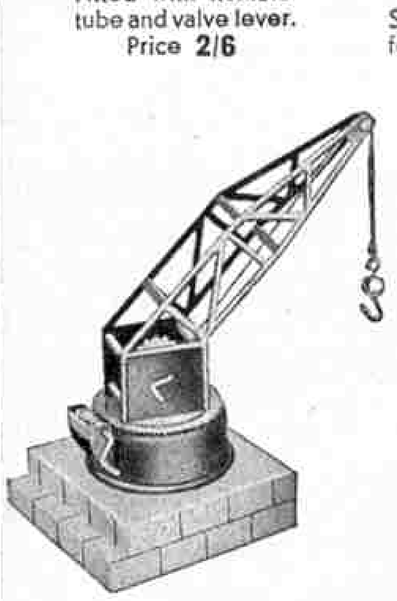
No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price **15/6**



No. 2 LEVEL CROSSING
Measures 13½ x 10¼ in., with two tracks of gauge O rails in position. Price **5/3**

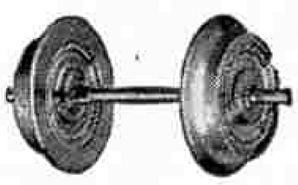
No. E2 LEVEL CROSSING (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks. Price **7/3**

No. 2 SIGNAL. DOUBLE ARM
"Home" and "Distant."
Price **2/3**



PLATFORM CRANE
Fitted with a crank handle and rachet mechanism, also gear for rotating crane. Price **3/6**

No. 2 SIGNAL CABIN
Dimensions: Height 6½ in., width 3½ in., length 6½ in.
Price **3/6**



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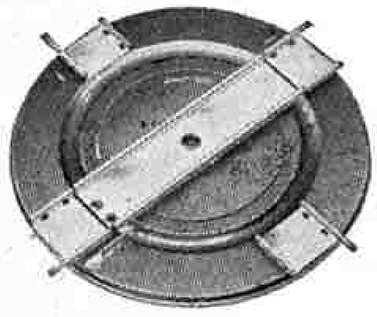
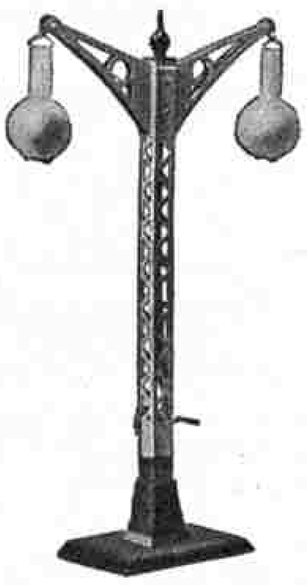
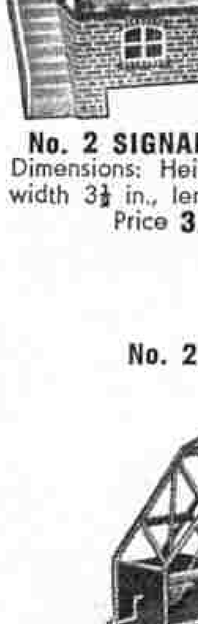


No. 1 TURNTABLE
Price **1/11**



No. 2 LAMP STANDARD
Price **3/9**



No. 2 JUNCTION SIGNAL
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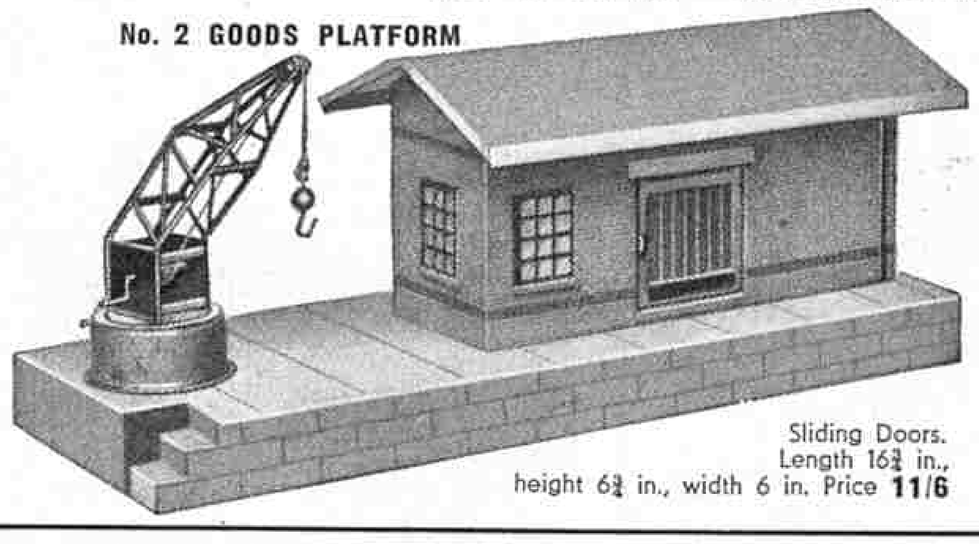
No. 2 GOODS PLATFORM



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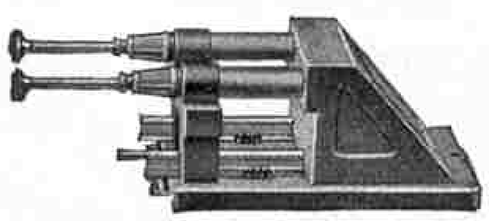

No. 2A BUFFER STOPS
Hydraulic type. Price **2/9**

No. 3A BUFFER STOPS
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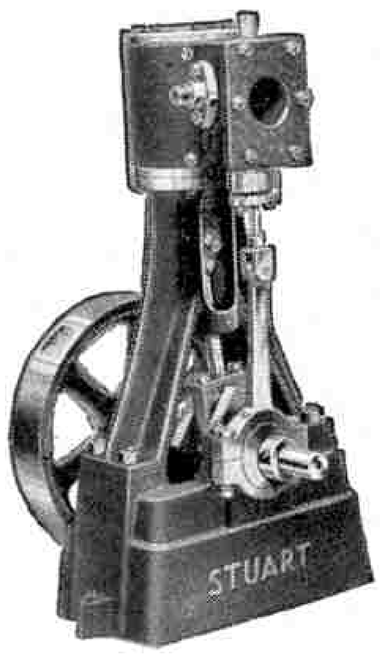

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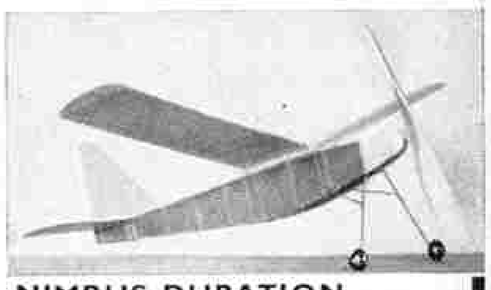

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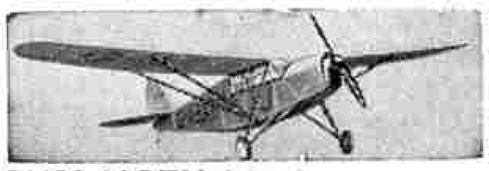

PUSS MOTH *(above)*
Wingspan 16 in. You can easily build this splendid flying model. Clear plan with full instructions. Complete kit, balsa, flying prop. Post free **2/6**

HESTON PHOENIX *(left)*
Wingspan 18 in. Marvellously exact with fine flying performance. Retractable undercarriage. Very clear detailed plan. Complete kit with hand-carved hardwood flying prop, cements, balsa, etc. Carriage paid **3/11**

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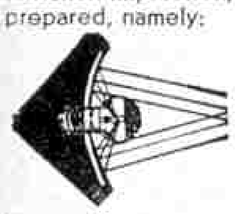
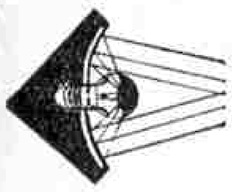
A MISTAKE CORRECTED!

Many Cyclists who have not tried Double Reflector Bulbs appear to think that the orange reflecting glass shown in black in the accompanying sketches is liable to prevent the rays travelling straight forward from the reflector of the Cycle Lamp. To correct this mistaken impression, the three sketches shown here have been prepared, namely:



Sketch 1. Shows the reflection from the filament direct to the Cycle Lamp Reflector, from which it will be seen that the rays are not in any way affected by the orange reflecting glass.



Sketch 2. Shows the rays which with ordinary Bulbs are otherwise lost, and which through being deflected by the orange reflecting glass upon the reflector of the Cycle Lamp can be described as **"Extra Brilliancy."**

Sketch 3. Shows the combined effect of the rays, both direct to the reflector and of the **"Extra Brilliancy"** rays retrieved by means of the reflecting glass of the Double Reflector Bulb.

Special Note. It must be understood that the few rays shown are illustrative only, and do not constitute the whole by any means, as space does not permit the inclusion thereof.

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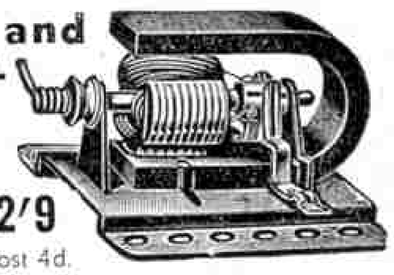

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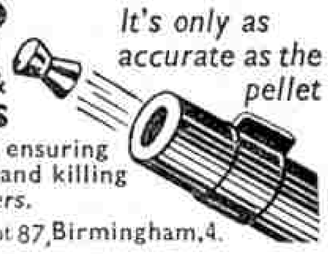

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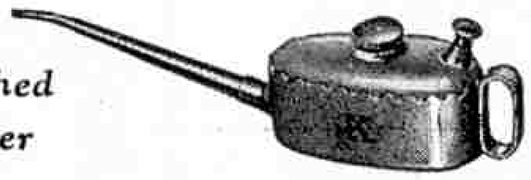

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I.C.S.

READERS' SALES AND WANTS

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

50 "Meccano Magazines," Nov. 1934–April 1938. 1935 issues bound. Offers? List on application.—Ormrod, Pen-y-lan, Ruabon, Wrexham.

Wanted. Meccano Steam Engine. Moderate price.—A. Bannister, 10, Towton Street, Manchester 9.

Sale. Stuart Mill Engine, S50 finished, complete with Displacement Lubricator, Split Bearing, Connections, etc. Condition perfect, 26/–.—T. Kennett, 14, Union Street, Blue Town, Sheerness, Kent.

Sale. Model Railway Accessories, Trucks; 300 superior Foreign Stamps; 1,600 clean Cigarette Cards; Chemistry Set with extra apparatus. List from—63, Bradford Road, Wakefield.

Sale. Model Farmyard, 110 pieces, good condition. 8/– and carriage.—Nash, Three Ashes, Hereford.

150 "Meccano Magazines"; 72 "Home Movies"; 50 "Amateur Cine"; 25 "Popular Science"; 40 "Practical Electrical Engineering." All clean. Offers.—Jackson, 22, Grappenhall Road, Stocktonheath, Warrington.

For Sale. "Meccano Magazines," 1934–1938 inclusive. 12/6, or 2/6 per year. "Popular Flying," 1935–1938 inclusive, bar April 1935, 9/6, or 2/6 per year. Frog Mk. IV Interceptor, perfect condition, 2/6. Bowman Stationary Steam Engine, little used, 7/6.—D. G. Braithwaite, 11, Marion Road, Southsea, Hants.

Sale. Meccano Steam Engine; Clockwork Motor (Reversing), good condition; highest offer accepted. Also "M.M.'s," January 1932–August 1938 (fair condition), 7/6 carriage forward.—L. Paulden, Woodvale Road, Knutsford, Cheshire.

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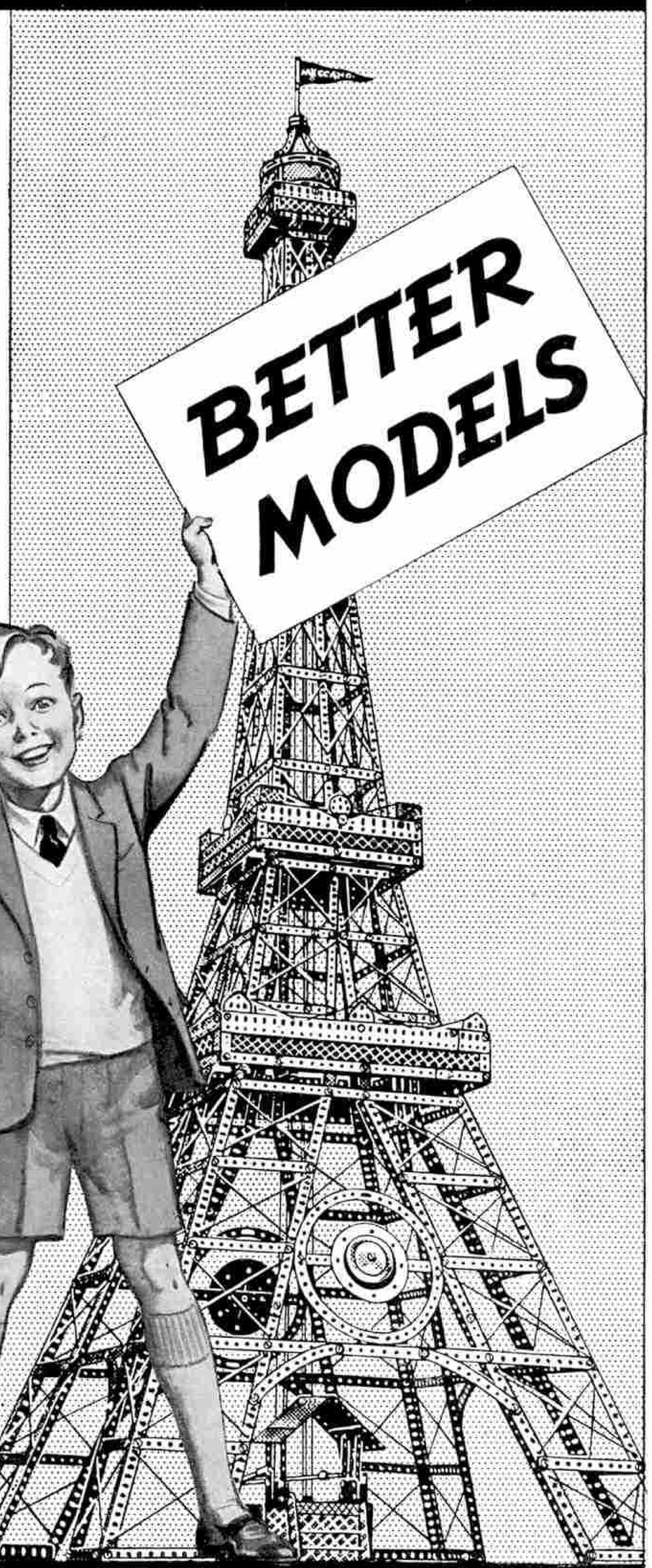

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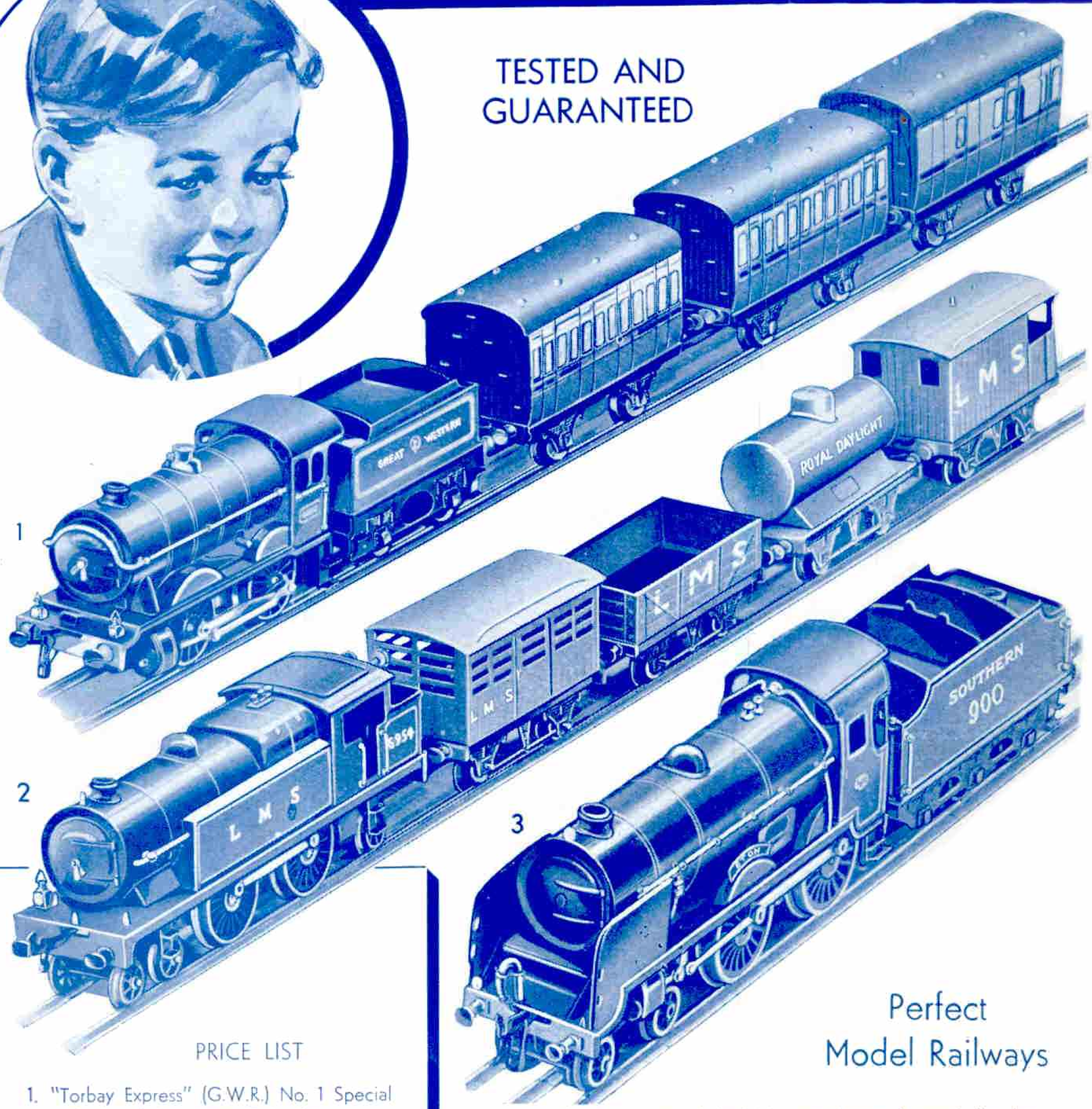

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